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GUANO,

ITS

ORIGIN, PROPERTIES AND USES,

SHOWING ITS IMPORTANCE TO THE

FARMERS OF THE UNITED STATES

AS A

CHEAP AND VALUABLE

MANURE:

WITH

Burkett

DIRECTIONS FOR USING IT.

NEW YORK:

WILEY AND PUTNAM.

1845.





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ADVERTISEMENT.

THE undersigned has received from the Peruvian Company, referred to in this pamphlet, a Cargo of Guano, which is offered for sale, in bags of about 150 lbs. each ; and is warranted to be the genuine PERUVIAN GUANO, corresponding to the tests and analyses herein stated.

[For prices, see last page of Cover.]

It may be had in small parcels not less than one bag, at *Thompson's Stores, Brooklyn, near Fulton Ferry*, and in larger quantities, by applying to

EDWIN BARTLETT,

42 SOUTH STREET, NEW YORK.

☞ Information addressed as above, giving the results of experiments with Guano in the United States, is respectfully solicited.

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INTRODUCTORY REMARKS.

AGRICULTURE is an art, upon which man, when advanced beyond the savage state, depends for the necessaries of life. Although in all ages and in all countries, it has been deemed the most honorable, as well as most useful, employment, it has been too often left to those, whose daily toils admitted of little leisure to learn the improvements of others, or to apply the discoveries of science in the economy of nature, to their own practical labors. The more general diffusion of knowledge is gradually breaking down the barrier between LEARNING AND LABOR, thus enabling the farmer to avail himself of the investigations of study, to lighten his toil, and increase its fruit. The necessities of this union become more urgent, as nations advance in population, and make larger requisitions upon the soil.

In no country, of ancient or modern times, has learning been more advantageously applied to the labors of husbandry than in Great Britain. Abounding in wealth, and resolved to be fed from her own corn-fields, with a great and increasing population upon a limited extent of territory, it has been found necessary to *extract from, without exhausting the soil, its greatest possible production*; and the public mind has been constantly and forcibly directed to this object. Whilst chemistry has analyzed plants to discover their composition and supply the waste caused by vegetation, nature has been explored to provide sustenance to the exhausted earth. The establishment of agricultural societies, for the collection and diffusion of knowledge, has given an impulse to the noble art of agriculture, which has raised

it to the dignity of a science. Nor has our own country been wanting in efforts to ameliorate and elevate the condition of the husbandman. The increasing numbers and respectability of our agricultural journals, and growing interest in our annual agricultural meetings, prove that the people are roused to the importance of the subject.

Nothing connected with Agriculture is of more vital importance than to know the best means of supplying to the soil, substances required for, and extracted by, vegetation. The kinds and qualities of MANURES suitable for this purpose, have excited the attention of all writers on this subject, and have been the study of practical farmers in all times. New articles have been found by chance, or have been discovered by the investigations of science, and pressed into the service of husbandry. Almost every substance of the animal and vegetable kingdoms, and many minerals, have been made tributary to this end. To these is now added GUANO, perhaps the most valuable of all. This comparatively new article in Europe and the United States, was extensively used in Peru, centuries before its conquest by the Spaniards, and has been in constant use since.

The following short account of its history and properties has been prepared with a view to call the attention of our farmers to its importance; and it is hoped that it may be a means of leading to a better knowledge of this most valuable manure.

It is matter of surprise that an article which is of such value to our agricultural interest, should continue to be taxed with a heavy duty. Being unenumerated in the tariff (probably from its being so little known when the last tariff law was passed as to have been overlooked), it now pays *twenty per cent. ad valorem*, which, in some cases, amounts to six dollars per ton.

New York, January, 1845.

GUANO,

ACCORDING to English orthography, but more properly HUANG, in the *Peruvian* or *Quichua* language, means MANURE.

It is only in the last four years, that this article has been imported into Europe, for sale; and still more recently into the United States. Although it had been in use in Peru, from our earliest records of that country, and was considered there of such importance as to be especially protected from waste by the laws of the Incas, and of their conquerors, the Spaniards, it had been overlooked by other nations. A few samples had been sent home by travellers in Peru, with which experiments were made in Europe and in this country; but more as a matter of curiosity, than from any expectation of finding it available to agriculturists. In 1840, the first cargo was sent to England, to test its qualities upon the soil. It was used with great caution; and notwithstanding the astonishing results of the earlier experiments, the fear that the enormous crops which it produced might exhaust the land, prevented the farmers, generally, from availing themselves of so rich a manure. Repeated experiments having convinced them that it gives vigor to the plant without injury to the soil, and that it is the cheapest as well as the most nourishing manure known, the increase of its consumption is such, that from a few tons required in 1840, upwards of *six hundred vessels* of a large class, are now employed in supplying the wants of Great Britain and Ireland. In the month of November last, upwards of *ten thousand tons* arrived in the port of Liverpool alone.

Of the various kinds of Guano which have been imported, that from Peru is found to be of the best quality. It is doubtless the excrement of sea-birds, mixed with their decayed carcasses, and those of other animals, frequenting the islands and headlands, where it is found; about which such immense clouds of birds are

constantly hovering, as to darken the sky.* Under the belief that it was the dung of birds, and supposing that the recent formations only were valuable, the Incas decreed the punishment of death against persons who should land on these islands during the breeding season. As no rain falls in that part of Peru where these deposits are found, they have been accumulating for ages; and in many places are covered with sand, drifted from the desert that skirts the coast. In some of the ravines and large crevices of the rocks, they are fifty or sixty feet deep. The writer has in his possession eggs of birds, dug from these beds at a depth of 40 feet from the surface. It is probable that the absence of rain on the coast of Peru is the cause of the superior quality of the Guano found there, over that of other countries. Whatever be the cause, the various analyses and experiments made and herein referred to, prove the fact.†

In 1840 and 1841, especial privileges were granted by the Peruvian and Bolivian governments, to a company, in which the respective governments are interested, to export Guano. *It is only through this company that PERUVIAN and BOLIVIAN Guano can be obtained.* Two cargoes have been sent to this country by their agents at Lima—one by the Orpheus to Baltimore; and one by the George and Henry to New York. Such only as is known to be of these two parcels, can be warranted genuine. It is the intention of the company to keep a supply in the United States; and to put it at such low rates as to make it the cheapest manure, thus causing it to be extensively used here, as it already is in England.

* It seems incredible that these Guanos could be deposited by the assemblage of birds that rest together, during the night; but wonder ceases when we consider the millions of them, as the Ardeas Phenicopteros, or flamingoes, that rise in the air like clouds of many leagues in extent; and that the deposits have been accumulating, perhaps, ever since the deluge. *Three Years in the Pacific*, pp. 247, 248. London. 1835.

† In a Treatise on Guano recently published in New York by D. P. Gardner, M.D., Lecturer on Agriculture in the New York Institute, &c., he remarks: "Common Peruvian Guano will be more permanent, the more urate of ammonia and phosphates it contains, and may benefit even a third crop; but the African variety, containing only soluble oxalate of ammonia, cannot be expected to produce any effect, except upon the immediate crop."

The various tests to which the different qualities of Guano have been submitted, and the results of experiments made and reported in the following pages, will, it is believed, satisfy all persons of its valuable properties as a fertilizer, and induce our farmers to avail of the opportunity now offered, of trying it on their own land.

As most of the experiments have been made in England, the editor has quoted largely from English works. The results of the few tests that have been made in this country, prove that Guano is as well adapted to our soil and climate, as to those of Peru and England. When properly used, it is not known, in a single instance, to have failed to increase crops beyond any other manure.

To those who are desirous of having early crops, it offers peculiar advantages. Roots and vegetables may be brought forward ten or fifteen days earlier, with this, than with any other manure. Dr. Gardner, already quoted, who appears to have given the subject much attention, says: "Guano will be found, by market gardeners, a valuable substance to forward their vegetables; it has been seen to advance some crops two or three weeks."

DIRECTIONS FOR USING GUANO.

Many and various minute directions have been given in England for using this manure; and experience will probably suggest better and more economical modes than any heretofore adopted, as the effects of climate upon its action become better known. Hitherto it has been used principally in Peru, where they have no rain, and depend upon artificial irrigation for watering the soil. By this mode of cultivation, the farmer has the advantage of regulating the supply of moisture, and choosing the time of applying it, after manuring; consequently the directions for use there, will not apply to other countries, but may, in some measure, serve as a guide in all, being the result of the experience of centuries. It is a general rule in Peru, to irrigate some days after manuring, and always to cover or mix the Guano with the soil as soon as applied. All the writers in England and in this country agree upon several essential points, among which are the following:

To keep the Guano from direct contact with the seeds and roots of plants:

To use it shortly before or after rain:

To cover or mix it with the soil immediately, when not used as a top-dressing:

When used as a top-dressing, to mix it with three or four times its bulk of earth, or some less pungent manure, that its strength may be diluted and not burn the plants.

From the many directions given, the following are selected:

From the Dumfries Herald of the 30th of March, 1843.

“ It should never be given in contact with seeds, as it kills the embryo in germination. For this reason I am doubtful whether it might aid or hurt the first stage of growth, if the seed were previously steeped in a watery solution of Guano. We know that carbonic acid and vinegar are given off by seeds in germination. These acids seem to attract ammonia so powerfully as to kill the germ. This effect will be most decided when the soil is very dry; but it is worth while to try, with solutions of different strengths,

whether water will take up azotized matter in a form capable of injuring tender seeds ; I wish to try it on red clover and turnip seeds. The Peruvians irrigate immediately after the Guano and crops are sown ; the sandy character of their soil and their want of rain makes this necessary. For the same reason they are said to give the manure in divided doses at different stages of growth ; neither our soils nor situation admit of general irrigation, nor do many of our crops admit of repeated manuring on the large scale, but we have in mixtures a substance more suited to our soil and climate than irrigation would be.

“ As the lumps are too strong, the Guano should be put through a fine sieve, and the lumps thus separated should be broken and put through the same sieve ; this will be best done during the operation of mixing ; but before proceeding to it I may mention a fact which farmers would do well to attend to. Guano rapidly absorbs moisture from the air, and this absorption increases both with the moisture of the air and the value of the manure. By drying two specimens of different values for an hour at 150° , I found the worst lost 15 per cent. between water and ammonia, and the best lost $22\frac{1}{2}$ per cent. ; and by again exposing these specimens to the open night-air for an hour at 35° , the worst recovered nearly 6 per cent., and the best rather more than $8\frac{1}{2}$ per cent. moisture. Inference 1. Guano is constantly gaining weight. This would add much to the profit of retailers, if it were not for the fact that part of this moisture (in mild weather), goes to aid the decomposition of the organic matter, and its escape in gas. Hence, 2. Guano is constantly losing value, and this loss is proportioned both to the value of the article when imported, and to the warmth and humidity of the air in which it is kept. 3. Hence, the farmer will find his profit in purchasing that which has been recently imported (if valuable) and in mixing it as soon as possible : for, if too damp, it will not pass through a sieve ; much will be lost ; and if he attempt to dry it by heat, he will lose much more. If any has already become too damp for economical use, it may be mixed with at least its bulk of dry but cold mill-dust, bran, or tail oats, well dried and ground in the mill. This will absorb much of its moisture, reduce it to a workable powdery state, and increase its value as a manure, without expelling its ammonia.

“ The objects of mixing Guano are, 1. To partly disinfect it by absorbing its volatile products and diminishing its smell. 2. To separate its active particles, and thereby diminish their action on each other. 3. To present it to warm soils in a form in which its action will be less violent at first, but more protracted and steady than when given in an unmixed state. Of course, the colder the soil, and the earlier the season when sown, the less quantity of mixture is needed, and conversely. But, as a general rule, it should be mixed as equally as possible with four times its bulk of finely-sifted, moderately-dry black or brown colored earth, or peaty matter, saw-dust, slightly-burnt clay, charred turf, coal or peat ashes,—whichever of these substances can be most conveniently had. Perhaps newly-burnt charcoal, used as soon as cold, is the best matter that can be had for mixing ; but as it can seldom be at the farmer’s command, any of the above matters

will answer in its stead. Where a considerable quantity of useles wood can be had, it might be piled up, surrounded, and nearly covered with clayey or spatty turf, and burnt with little admission of air. When cold, the charcoal, clay, and charred turfy matter, if well broken with a spade, mixed, and put through a sieve, will make an excellent mixture for Guano, especially for light warm soils. Some have mixed Guano with sand, and when for a cold clayey soil this mixture seems very suitable; only sand need not be given in more than double its bulk, and should be put in the soil soon after mixing, whereas any of the other mixtures may, with advantage, stand beat up, under cover, for a week or more, according to the weather, character of the soil, and distance at which it is to be put below the seed, and also in proportion to the quantity of Guano given to the acre. The colder and heavier the soil, and the colder the weather, the more slightly the manure ought to be covered, and conversely. No rules can supersede experience in this. When either dung or bones are given as part of the manure, and when the soil is moderately moist, or disposed to clay or peat, the Guano should be put near the seed. Again, where the ground has just been limed, the Guano ought both to be given in a large quantity of mixture and covered rather deeper than in ground not limed for a year or more. On light soils lime should, if possible, be mixed some weeks before Guano is given. As lime rapidly expels the ammonia from Guano, it soon renders the manure inert. No farmer who understands the matter will mix either Guano, or dung, or bones, with either slacked lime or fully-burnt wood-ashes, or burnt couch, unless the couch be well mixed with earth, and have stood some time in the heap after it is cold. Any of these substannes, if in contact with Guano, drives off its ammonia. Although Guano, slightly mixed, may be sown above bones, yet bones and Guano ought not to be mixed before they are sown, as they act on each other, if good, and the readiest part of the manure is thus dissipated before it reaches the soil. A mixture of gypsum with Guano can seldom do any hurt, and for turnips or clover, on light soils, it may often be advantageous. When our turnip soils are very dry at sowing, it might be a great advantage if the top of the drills could be watered with a weak solution of Guano. This might be done at no great expense, by a watering-pan having a very small rose, perforated with only three or four small holes, so as to spread the liquid but little. A woman might go steadily along with this pan, followed by another with a supply of liquid, a large barrel or tub standing at the upper end of the drills. If this be found beneficial, a machine might be made to carry a larger supply, and water two drills at once. It is likely that this watering would both disgust the turnip-fly, and quickly put the plants beyond its power.

“From 60 to 70 per cent. of good Guano are either dissolved or readily suspended in water. The solution may be tried of different strengths, from $\frac{1}{2}$ to 1 cwt. per acre of the powder. This would require about 160 gallons of water, or 1 gallon per perch, or $40\frac{1}{2}$ yards' length of a 27-inch drill. It may be difficult to make less liquid go over this length, and a larger quantity may be found inconvenient in practice. The undissolved parts of the

Guano may be mixed in sand or mould, and used as a dressing over dung for later turnips, or composted for after-use on grass.

“*Quantity of Guano per Acre.*—This is not so easily determined as some gentlemen seem to think. The character and state of the soil, the locality where it is used, the period of the season when it is given, the kind of crop intended, the previous manure and system of cropping, the natural action and durability of Guano as a fertilizer, the quality of the article used, and the amount of expectation contemplated, have all to be taken into account, and may vary the quantity from 2 cwt. to 8 or 9 cwt. per Scotch acre* when given alone, and half the above quantities when a due proportion of dung, bones, or rape-dust is given at the same time. When the soil is naturally warm, and has been brought to a high state of fertility, and where the farmer’s interest in the land extends over only four or five years, he will most economically promote it by giving merely enough of Guano to start the plants with vigor, and, after a year or two, a light dressing of some suitable saline manure. If allowed, he may very cheaply ‘take his own out of the soil,’ in this way, and leave it as poor as he could wish.

“We have heard much of the solar light enabling the leaf to decompose carbonic acid, and of plants receiving their carbon from the atmosphere. In hot and tropical climates, where sunshine is more abundant and steady, and where his rays are more direct and powerful, there is reason to believe that this is true to a considerable extent—(the large size of leaves and blossoms, compared with ours; the comparative general deficiency of vegetable matter in tropical soils; the beneficial excess of saline matter there; and every other analogical fact, confirm this supposition)—but in our climate, where the heat is much less, and where the sun’s rays are both more oblique and clouded during much of the season, little atmospheric carbon can be appropriated, except by our green crops, and therefore the supply must be chiefly afforded by the soil. Whatever, then, causes the evolution of more carbonic acid from the soil than it brings to it, gradually exhausts the soil not only of carbonic acid, but also of the bases dissolved and carried from the soil by this acid. In the soil, any alkaline matter, as ammonia (from Guano, dung, or bones), lime, and most of the salts, dispose the formation of carbonic acid, and commence a general fermentation, which extends to the dead vegetable matter in the soil, and gradually reduces its quantity. Where the vegetable matter is in a very inert state, and the soil is coarse, as in clayey land recently drained, either lime must be given in a previous fallow (and, when practicable, this ought to be done), or the manure must be good farm-yard dung, not over-fermented, or the Guano must be given in a heavy dose (say five to eight cwt. at least per acre, put in and covered moderately deep some weeks or months, if practicable, before the seed); for in these soils it requires much to begin fermentation so effectually as to act on the inert soil, and bring it into a fertile state. A good turnip crop may be used on such soils with less Guano, but then the following white crop will show that the manure was wasted before the *inertia* of the soil

* A Scotch acre is equivalent to 1½ English or statute acre.

was overcome. On the contrary, a soil which, by judicious culture, is already disposed to fermentation, may be made to yield crops for several years, by using repeated and varied small doses of ammoniacal and calcareous stimulants or salts, with occasionally a little dung, till the soil is reduced to ruinous barrenness. In warm, light soils, it will require considerable management to give enough of good Guano to carry through a rotation without injuring the crop at first by its violence. Two or three cwt. per acre may be proper, if given alone; but much better give half dung or bones, and half Guano, for such soils. Cold, high, clayey soils, even though under previous good management, will take four to five cwt. per Scotch acre, according to their exposure; and if (as is too often the case) lime or dung has been given them too sparingly, they may require more.”—*P. Garden, Glenæ, Dumfries.*

“*Liquid Guano.*—As a liquid manure, 4 lbs. of Peruvian or Bolivian Guano to 12 gallons of water are sufficient. The water should stand 24 hours before use, and when drawn off, 12 gallons more may be put to the same Guano.”

From “Guano as a fertilizer,” by Cuthbert W. Johnson, F.R.S., &c.

“It would appear, then, from the results of the various trials which have been recently carried on in this country upon the Guano, that it is certainly a fertilizer possessing powerful effects, but it is pretty clear that it must be used in larger proportions than was formerly suggested—from three to four cwt. per acre appear to be the proper proportion. It is also evident, from the trials which I have witnessed, as well as from many whose results have been published, that it should *not* be applied in immediate contact with the seed. If, therefore, it is applied by the drill, which I believe to be the best mode, it should be applied by a separate coulter, and by the mode adopted in the improved Suffolk drills, by which the manure is deposited in the soil so much deeper, and so much in advance of the seed, as to allow a portion of the soil to be interposed between the seed and the manure beneath it. Like all other concentrated fertilizers, it is pretty certain, that for the most successful development of its powers, it requires a considerable supply of moisture, and will, therefore, produce the best results during wet seasons. It is used, it seems, in many situations in Peru, which are immediately afterwards irrigated.

“From these facts, and from the general good effects which it has been noticed to produce on grass-lands in St. Helena and in Lancashire, and other of the most rainy English counties, it is evidently well adapted for a top-dressing for meadows and low situated lands in general.

“I think also, from my observations, that, if the Guano is well mixed with three or four times its weight of finely-sifted earth, and suffered to remain for some weeks in this state, before it is used by the drill, or applied broad-cast, its effects would be the more considerable, and the sometimes too powerful effects of Guano upon the growing crop avoided.”

From "Hints to Farmers on the Application of Guano." London. 1844.

"When required for any description of crop to be raised from seed, great care should be taken to have the Guano well mixed with the soil, by lightly ploughing, and then harrowing it in, so as to have it regularly distributed into the land before sowing, as it is ascertained that seed will not germinate when it comes into *direct* contact with Guano. When wood-ashes, charcoal, powdered cinders, gypsum, or any other article, can be easily procured to mix with the Guano, it may be desirable to do so, in order to secure its more equal distribution; but we do not consider this indispensable, so long as the Guano is well mixed up with the soil, as described.

"When required for top-dressing grain or grass crops, apply it, if practicable, on a damp or wet day, for the sooner rain falls after the application of Guano the better. Above all, do not apply it on a windy or boisterous day, or much will be lost.

"It is impossible to state the exact quantity requisite for every crop, and upon every variety of soil; but we think the practical farmer will, from the different results and modes of use given, easily find out the necessities of his own lands in this respect, for much, as to quantity, must depend upon the state and condition of his farm, from previous cultivation.

"The Peruvians apply Guano at three different times to the growing crop—first, when the plant appears; secondly, when in flower; and thirdly, at the formation of its seed. After each application, the land is immediately irrigated; and if the weather should prove dry in this country after the Guano is applied, irrigation would be highly advantageous. There is, however, a method of making a solution of Guano:—4 lbs. to 12 gallons of water are sufficient. Let it remain twenty-four hours, and then draw off the solution for use; after that, put 12 gallons more water to the same Guano.

"Guano should not be mixed with slacked lime, nor put on light land which has been lately limed, because the lime rapidly expels the ammonia from the Guano, and, of course, soon impairs its utility. A few weeks should elapse between the applications. Neither should bones and Guano be long mixed before they are used, because they act on each other, and their readiest parts are often thus dissipated before they can be applied.

"The purchasers of Guano should be aware that the volatile part of the ammonia is liable to escape, either by exposure of the Guano to air, or by its getting wet. By the addition of about 32 lbs. sulphuric acid (oil of vitriol), mixed with twice its weight of water, and thoroughly incorporated with each ton of Guano, a *fixed* ammoniacal compound will be formed. By this simple and cheap method the Guano may be rendered better for the purposes of manure, and can be kept unimpaired for any length of time."

From Gibbs and Myers' Pamphlet. London. 1844.

"It appears, from the result of numerous experiments, that the best mode of applying Guano for turnips of all kinds and mangel wurzel is,

after mixing it with about four times its bulk of finely-sifted mould, lightened, if at all heavy, with ashes, to drill it into the ground with the seed—using the instrument which is commonly employed for drilling the manure and seed at the same time. By this means the Guano compost is deposited in the soil so much deeper, and so much in advance of the seed, as to allow a portion of the soil to be interposed between the seed and the manure beneath it. If the seeds are sown broad-cast, the Guano compost may be applied in the same way, that is, broad-cast, before the last ploughing.

“For potatoes a similar compost is recommended to be applied by hand at the bottom of the trenches in which the sets are to be planted, interposing about an inch of soil between the manure and the sets. Where potatoes are planted whole, and from two to three feet apart, a quantity of the compost, proportioned to the quantity per acre intended to be used, should be deposited at the bottom of the hole in which the potatoe is to be planted, introducing the quantity of soil between the compost and the potatoe, as stated above. Great advantage has been found from a second application of Guano to crops of potatoes, and this should be made upon the first hoeing.

“Using the same compost for grain-crops, it should be applied to the ground before the last ploughing.

“To all kinds of grass, whether natural or artificial, the same compost may be applied with great advantage in the month of April, distributing it broad-cast, as evenly as possible, at the rate of about three cwt. Guano per acre.

“Where any crops appear to be coming up weakly, or to be injured by worm or fly, the same compost, at the rate of about two cwt. Guano per acre, may be advantageously used by throwing it broad-cast over the growing crops.

“To whatever crop Guano is applied, it is desirable that water, in some form, should soon follow; and, therefore, showery weather should be chosen for the time of using it.”

From a Pamphlet on Guano published at Baltimore, 1844.

“1. If intended for drill-husbandry, or to be used in the hill, it should be mixed in the proportion of one part Guano to four or five parts of wood-earth or mould, or any other fertile earth, or thoroughly decomposed manure—or one part Guano, one part ashes, and three parts rich mould or well-rotted manure.

“2. It is best for the above purposes, not to let the mixture come in immediate contact with the seed.

“3. For broad-cast application, it may be sown as plaster is, after it shall have been reduced into powder either by itself, or in compost as prescribed in Rule number one. Whether used alone or in compost it should be sown and harrowed in, after the crop may have been sown and ploughed in.

"4. It may be sown in compost, after a crop may have come up.

"5. It is a good and highly fertilizing manure for all descriptions of crops, whether grain, grass, or roots, and if properly used, will not only increase the quantity of the product, but improve the quality also.

"6. For root crops 200 lbs. used in compost as named in Rule number one, is sufficient for an acre of ground—and the same would be sufficient for an acre of corn, if used in the drill, or hill.

"7. For wheat, rye, oats, barley, tobacco, or any of the grass crops, from 200 to 300 lbs., according to the quality of the land, will be found sufficient for an acre.

"8. It should, if possible, always be applied in *wet* weather, and covered either lightly with the plough or harrow: where neither of these modes may be practicable after sowing Guano, the roller should be applied.

"9. In applying it to old meadows, or meadows which may have been set for some time, it should be harrowed in and then rolled.

"10. If convenient, plaster may be very advantageously used with it in the proportion of one bushel of plaster to 100 lbs. of Guano.

"11. In applying it to grass lands and meadows, the month of April would be the most suitable period, as a great object is to dissolve it in order that its virtues may promptly come in contact with the roots of the plants. It may, however, be used at any *wet* season.

"12. Any compost made of Guano, should remain a few days before being used.

"13. Where liquid applications of Guano may be desirable, as on tobacco beds, or in gardens, 1 lb. of Guano dissolved in four gallons of water, will comprise a most enriching manure. The sediment remaining, if any, may very advantageously be used with an equal quantity of water as at first used.

"14. Where plaster cannot be obtained to incorporate with the Guano, a most excellent substitute will be found in pulverized charcoal, to be used in the same proportion as plaster."

From an "Essay on the History, Character, and Value of Guano. By D. P. Gardner, M. D." New York: 1844.

"*The time and mode of application.* On this point we may learn from the Indians, who applied it to the plant at the time of the Spanish invasion, and have transmitted the practice to the Peruvians. Frezier gives the following account of the cultivation of their pepper: 'When the plants are fit to set out, they are arranged along the channels of irrigation, and each pepper manured with as much Guano as can be held in the hollow of the hand. When the flower forms, they add a little, and when the fruit forms, again a good handful—taking care always to irrigate, without which the plants are burnt up by the Guano.' Maize is manured when about a foot high, and again as the ears begin to form, half a handful each time, which is well mixed with the soil and irrigated. In Mr. Teschemacher's experiment, a tablespoonful was sown with the grain, and three teaspoons-

ful when the plants were a foot high. The early application destroyed several of the young plants.

"In most of the experiments detailed, Guano was sown broad-cast, or drilled immediately before or after the seed; but the practice appears, on the whole, hazardous, and in several instances has led to the destruction of the young plants, which turn yellow and are burnt by the ammoniacal solution. It is moreover without economy, since the apparent effect of the manure is to stimulate or force the growth; it is, therefore, better to add it to that already fairly tested—for instance, to wheat in spring. At the period of flowering, the plant exhausts much of its own nitrogen, and requires a supply from without; it is, therefore, a good time for application. At periods when the attacks of injurious insects are apprehended, a new application may do much good, by giving the plants sufficient growth to resist the injuries. There is no doubt that two or three well-tried applications are very superior to one, and the difference of effect will more than repay the cost of labor.

"Another essential is the probability of rain, without which the finest crops will be destroyed, by the caustic properties of the manure. After rain and during moist weather the best effects are seen.

"It should be mixed with two or three times its weight of garden mould, or fine soil, when sown broad-cast, so as to divide it well, and the Guano should be in fine powder and free from lumps. When applied by the hand, to corn or tobacco, it should be well worked into the land. On tobacco it may be added when transplanted, and at the topping season. On sugar canes and cotton it may also be applied twice or more: when they start and as the first signs of flower-buds or tassels appear.

"The Guano must not be allowed to touch the seeds or plant to which it is applied.

"It is recommended, by the English farmers, to divide the supply for a given season, as the sprouting of grass, into two or three parcels, and sow broad-cast at intervals of a week or ten days.

"In consequence of the necessity for moisture, some have supposed that a solution would be the best form of application. This depends upon the variety of Guano; that from Africa is sometimes soluble to the extent of 60 per cent., whilst the American is much less so. The insoluble matter, phosphates of lime and magnesia, are sometimes the principal manure. Under these circumstances, I do not think that the solution is advisable, unless no rain is expected and there are facilities for irrigation. It is also less manageable in its application."

From a Pamphlet published by J. F. Cannell. Liverpool: 1843.

"To each cwt. of Guano add four cart-loads of dry earth, well riddled, which may be taken from either head or foot ridge of a field; then form a bed (in a dry place under cover), with a layer of the riddled earth about a foot deep, then a layer of Guano about an inch deep; so on, layer and layer about, until all is finished. Letting it lie so as to ferment for six or

eight hours, then turn it fairly over, letting it lie to eight or ten hours more ; then riddle all together, when the lumps of Guano, if any, will be easily broken with the back of the spade or shovel. By this mode, the whole will be converted into one mass of Guano, when it may be sown broad-cast over grass land, wheat, barley, or oats ; choosing a wet day for sowing on grass lands, but a dry day for sowing on wheat, barley, or oats ; giving a very slight harrowing at the time of sowing, and at the rate of three cwt. of Guano so mixed to the Irish acre, for wheat, barley, oats, and grass land ; with four cwt. per acre for turnips or potatoes."

The following remarks on the mode of using Guano in Peru are translated from a letter to the editor, written by a gentleman of intelligence, who has spent most of his life in that country, and is familiar with the subject :

"Respecting the application of Guano to the culture of Indian corn, so extensively grown in the United States, and almost unknown in England, I beg leave to state to you the manner in which it is used by the agriculturists of Peru, in order that you may make it known to your countrymen, who may be disposed to try it in the cultivation of that article.

"About six weeks after the seed is planted, and after having eradicated the more feeble plants, so as not to leave more than two stalks growing together, a small quantity of Guano, say as much as may be readily taken up by the thumb and two fingers, is applied around the roots of the plants. In fifteen days after this application is made, the field is irrigated ; for, if left longer without water, the plant is burnt by the Guano, and sometimes destroyed. As soon as the tassels appear, a second application of Guano is made, of about double the former quantity, say a small handful, to each hill, when the earth is hoed up round the plant, and twelve days afterwards the field is again irrigated abundantly, and this irrigation is frequently repeated until the corn is ripe.

"By this mode of cultivation, enormous crops are obtained. In sandy and apparently sterile soils, which, without manure, yield only about thirty fold of small, sickly, and perishable grain, when manured in this manner with Guano, *yields three hundred fold*, of a large grain, which may be preserved a long time without deteriorating.

"Here (in Peru) but little study is made of economy in the use of Guano, as its cost is trifling ; but when the additional expense of distant transportation is considered, I suppose more pains will be taken to ascertain the most profitable modes of using it. What has been said, may serve as hints to your practical farmers, and I send you these observations in the hope that they may be useful, in a country so emphatically agricultural as the United States."

To the foregoing remarks the editor would add, that nowhere does Indian corn yield more abundantly than in Peru, and its quality

is not excelled, if equalled, in any other part of the world. A bushel of corn upon the cob yields nearly three pecks of shelled corn, of a solid, flinty grain, making a beautifully white and sweet meal.

With these directions, which embrace the substance of what has been published on this subject, the quantities to be used and the modes of application must be left to the judgment of the practical farmer. It will be seen, by reference to the experiments herein reported upon, that *one hundred pounds of Guano* have been found equal to *five or six tons* of common barn-yard manure ; but as there is no fixed standard of manure by which to value the Guano, this affords no certain rule of comparison. Experience will be a better guide than estimates.

SELECTIONS

FROM

RECENT PUBLICATIONS,

IN

EUROPE AND THE UNITED STATES.

The following extracts are from a pamphlet published in 1843, by Cuthbert W. Johnson, F. R. S., Corresponding Member of the Agricultural Society of Koningsburg, and of the Horticultural Society of Maryland, Editor of Farmers' Encyclopedia, Farmers' Almanac, &c.

"The use of the dung of birds as a fertilizer, is not altogether a modern improvement. That of poultry, for instance, has been adopted as a manure from a very early period. (2 Kings, iv., 25.) M. P. Cato, the earliest of the writers upon Agriculture (*lib.* 86), commends the use of pigeons' dung for meadows, corn-lands, or gardens; and in England, the value of pigeons' dung has long been known by the farmer. John Worlidge, in 1669, was warm in the praise of the dung of fowls. "Pigeons', or hens' dung," he says (*Mysterie of Agri.* 71), 'is incomparable: one load is worth ten loads of other dung, and is, therefore, usually sown on wheat or barley that lieth far off, and is not easy to be helped;' and he adds in another place, 'a flock of wild geese had pitched upon a parcel of green wheat, and had eaten it up clean, and sat thereon and dunged it for several nights, that the owner despaired of having any crop that year; but the contrary happened, for he had a far richer stock of wheat there, than any of his neighbors had.'

"Guano is, it seems, the European mode of pronouncing the Peruvian word 'Huano,' or Manure. This substance exists in large quantities in some of the rocky islands off the coast of Peru, where, in the course of ages, it has been formed by the deposit of the excrements of innumerable multitudes of Sea Fowl, who haunt these localities, especially during the breeding season.* It exists, according to M. Humboldt (*Davy's Elem.*

* "It forms irregular and limited deposits, which at times attain a depth of 50 or 60 feet, and are excavated like mines of red ochre.—Its real ori-

Ag. Chem., 296), in the greatest abundance in some of the small rocky islands of the Pacific Ocean, as at Chinchá, Ilo, Iza, and Arica. Even when Humboldt wrote, some twenty years since, fifty vessels were annually loaded with the Guano at Chinchá alone, each trader carrying from 1500 to 2000 cubic feet. The Guano is found, according to Liebig, (*Organic Chem.*, 81), on the surface of these islands, in strata of several feet in thickness, and is, in fact, the slowly putrefying excrements of innumerable sea fowl that remain on them during the breeding season. It is used by the farmers of Peru chiefly as a manure for the maize or Indian corn, and it is said sometimes in the small proportion of about 1 cwt. per acre. 'The date of the discovery of the Guano and of its introduction as a manure,' says Mr. Winderfeldt (*Brit. Farm. Mag.*, vol. vi., p. 411), 'is unknown, although no doubt exists of its great antiquity. In many parts of America, where the soil is volcanic or sandy, no produce would be obtained without the Guano.'"

* * * * *

"In a recent obliging communication (*Dec. 29, 1842*), from a gentleman who has resided many years on the coast of Peru, (Henry Bland, Esq., of Liverpool), he observes, in answer to some questions which I had addressed to him, with regard to the uses of the Guano, the soils and the climate of Peru :

"The valleys on the coast of Peru consist chiefly of a light sandy soil. No rain falls upon that part of the coast where I have seen Guano used. Neither are the dews so copious as to be considered by the Peruvian farmer to be of any importance in promoting vegetation in the valleys.

"On the tops of the coast hills a slight verdure is produced by the dews in the winter season, but it does not remain for more than from one to two months. The land of the valleys is irrigated, but without the limits of irrigation all is a desert, with the exception of the slight vegetation I have alluded to. This is the state of the coast, from about 5 degrees to 22 degrees south latitude.

"I do not believe that so small a quantity as 1 cwt. of Guano per acre is found sufficient for the soil upon any part of the coast of Peru. In the neighborhood of Arequipa, the first crop is maize, (Indian corn). The seed is sown in drills or trenches, and the bunches (three or four plants I call a bunch) come up about two feet apart. When the plants are six or eight inches above ground, a pinch of Guano (as much as can be easily held between the thumb and two fingers), is placed around each bunch, and the

gin was well known to the Government of the Incas, and its national importance fully understood. It was made a capital offence to kill the young birds on the Guano Islands.' *Professor Johnston, Jour. Roy. Ag. Soc.*, v. 2, p. 103. The quantity of Guano importing into England has now, from small beginnings, become considerable; about 20 casks were imported in 1840, by Messrs. W. J. Myers and Co., of Liverpool. In June, 1840, the first cargo arrived at that port, and since then about 20,000 tons have been imported. 'There will be no difficulty,' says a Liverpool merchant, 'in obtaining from the coast of Peru, for the next thousand years, a supply of Guano, adequate to the wants of the British Farmer.'

whole is usually irrigated immediately afterwards. Guano is again applied when the plant is about throwing out its fruits; *a handful* is then applied to each bunch, and the irrigation immediately follows. The next succeeding crops, potatoes and wheat, are produced without any further application of manure.

"In the valley of Chancay, distant from Lima about 40 miles, a soil which, without Guano, is capable of producing only fifteen for one of Indian corn, with guano is made to produce three hundred for one. In speaking of Guano, the Peruvians say, "Aunque no sea santo, hace milagros."—Guano, though no saint, works miracles."

"Guano, to be *good*, being in some measure soluble in water, can never be found in its most powerful state, in any climate where rain falls; and consequently any that may be brought from the coast of Peru, taken from without the *limits of dryness*, must be of inferior value, compared with that which comes from the Chincha Islands, situated in about $10\frac{1}{2}$ degrees south latitude, and about ten miles distant from the main, and from Paquica on the coast of Bolivia, in latitude 21 degrees south. Upon these islands, and at Paquica, is the principal deposit of Guano. Two or three cargoes of Guano from the coast of Chili, (where rain is frequent), have found their way into this country, and have, I believe, been sold for Chincha Guano, thus injuring both the character of the best Guano as a manure, and the importer of the genuine article.*

"I may mention a circumstance to show the little estimation in which nitrate of soda, compared with Guano, is held by the Peruvian farmer.

"On the coast of Peru nitrate of soda is produced at a distance of about forty-five miles from Iquique, the port at which the principal part of the nitrate is shipped. For mules to transport the nitrate from the place where it is made, to the port of shipment, the nitrate merchant, who sells for export, depends chiefly upon the farmers who reside in the immediate neighborhood where the nitrate is produced, and he can only secure their services by having always ready for them in the port of Iquique, a return load of Guano, which they carry back to manure their farms, after having carried a load of nitrate almost from their own doors, to the port of Iquique."

"Guano appears in the state in which it has been recently introduced into this country to be a fine brown or fawn-colored powder, emitting a strong marine smell; it blackens when heated, and gives off strong ammoniacal fumes. When nitric acid is mixed with it, uric or lithic acid is produced. It has been analyzed by various chemists. In 1806 an analysis of a very elaborate description was published by MM. Fourcroy and Vauquelin; they

* "It is the dryness of the climate," observes Professor Johnston, 'which has permitted the Guano to accumulate on these coasts. When we reach a region in which from local causes the dews are heavier and the rains more frequent, the accumulation ceases; cold water dissolves at least three-fifths of the Guano in the state in which it reaches us. A single day of English rain would dissolve and carry into the sea a considerable portion of one of the largest accumulations; a single year of English weather would cause many of them entirely to disappear.'—*Jour. Roy. Ag. Soc.*, v. ii., p. 315.

found in it a fourth of its weight of uric acid, partly saturated with ammonia, and partly with potash, some phosphate of lime and ammonia, and small quantities of sulphate and muriate of potash, a little fatty matter, and a portion of sand. It has more recently been analyzed by Mr. Hennell, of Apothecaries' Hall, who found in Guano—

	Parts.
Bone earth, - - - - -	30.5
Sulphates and muriates, - - - - -	3
Uric or lithic acid, - - - - -	15
Carbonate of ammonia, - - - - -	3
Matters volatile at 212°, consisting chiefly of water and carbonate of ammonia, - - - - -	12
Other organic matters, - - - - -	36.5
	<hr/> 100.00 <hr/>

“It has also been analyzed by Mr. Brett, of Liverpool, who found in 100 parts—

	Parts.
Earthy insoluble salts, chiefly phosphate of lime - -	29.2
Soluble salts, fixed alkaline, sulphate, and muriate, - -	2.5
Organic matter, - - - - -	68.3

“The organic matter consists of—

Lithic acid, - - - - -	16.1
Ammonia, - - - - -	8.7
Other organic matter and moisture, - - - - -	43.5
	<hr/> 68.3 <hr/>

“The composition of Guano varies, however, considerably. According to the analysis of MM. Voelckel and Klaproth, the varieties which they examined contained—

	Voelckel. Parts.	Klaproth. Parts.
Urate of ammonia, - - - - -	9	16
Oxalate of ammonia, - - - - -	10.6	0.0
Oxalate of lime, - - - - -	7	12.75
Phosphate of ammonia, - - - - -	6	0.0
— ammonia and magnesia, - - - - -	2.6	0.0
Sulphate of potass, - - - - -	5.5	0.0
— soda, - - - - -	3.3	0.0
Chloride of sodium (common salt), - - - - -	0.0	0.5
— ammonia, - - - - -	4.2	0.0
Phosphate of lime, - - - - -	14.3	10
Clay and sand, - - - - -	4.7	32
Undetermined organic substances, of which about 12 per cent. is soluble in water, a small quantity of soluble salt of iron, water, - - - - -	32.53	28.75

“In a few words, it may be regarded as an impure compound of phosphate of lime, of urate of ammonia, and other salts. There is no doubt but that it is a very powerful manure; the very composition of its salts would indicate this fact. Thus, uric or lithic acid, which is a fine white powder, nearly insoluble in water (1720 parts of water only dissolving one part of uric acid), is composed, according to Dr. Prout (*Thomson's Chem.*, vol. ii., p. 187), of—

Hydrogen, - - - - -	0.125
Carbon, - - - - -	2.250
Nitrogen or azote, - - - - -	1.750
Oxygen, - - - - -	1.500
	<hr/>
	5.625

“According to the analysis of Professor Johnston, the quantity of sand always present in the imported Guano varies from two to eleven per cent. ; the sand consisting chiefly of mica, quartz, and feldspar, the debris of the rocks of the coast of Peru. A specimen, which Professor Johnston examined, he describes as being ‘of a brownish red color; it is evidently a very ancient deposit, and has undergone much decomposition. It consists of a powdery portion, mixed with lumps of various sizes. The latter, when broken, exhibit an aggregation of minute crystalline plates, are much richer in ammonia than that which is in powder, and are free from sand and stones. When broken up, however, the lumps speedily lose their crystalline appearance, give off ammonia, even at the ordinary temperature of the atmosphere, and assume the condition of the powdery portion with which they are mixed. The fresh Guano,’ adds Mr. Johnston (*Jour. Roy. Ag. Soc.*, vol. ii., p. 311), ‘is more valuable, because it contains more of the uric acid.’ We have no analysis of the recent droppings of any of the birds which frequent the shores of Peru; they would probably be found to differ in some degree, not only with the species of bird, but also with the kind of fishes on which at different seasons of the year they were found to prey. We possess analyses, however, of the excretions of other birds which live chiefly upon fish, from which we are enabled to form an opinion as to what the recent Guano is likely to be. Thus, Dr. Wollaston found those of the Gannet (*Pelicanus bassanus*), when dry, to contain little else but uric acid, while in those of the Sea Eagle, Coindet found—

SOLID EXCRETIONS.			LIQUID EXCRETIONS, DRIED.		
	<i>Per cent.</i>		Uric acid, - - -		59
Ammonia, - - -	9.2		Earthy and alkaline phos-		
Uric acid, - - -	84.65		phates, sulphates, and		
Phosphate of lime, - -	6.15		chlorides, - - -		41
	<hr/>				<hr/>
	100.0				100

“The ingredients of which Guano are composed are all powerful manures; for the salts of ammonia, as I have elsewhere remarked, are a class of fertilizers whose use by the farmer will most likely be yet considerably

extended. Ammonia exists in considerable quantities in fermenting dung, and has been detected in minute proportions in rain-water. Liebig even attributes some of the effects of rain-water to its presence. The salts of ammonia are in general fertilizing in their effects upon vegetation. Soot owes part of its efficacy to the ammoniacal salts it contains. The liquor produced by the distillation of coal contains carbonate and acetate of ammonia, and this liquid of the gas-makers is a very good manure."

* * * * *

"There is no doubt but that the salts of ammonia, and all the compound manures which contain them, have a very considerable forcing or stimulating, or perhaps, from their decomposition, nourishing effect upon vegetation. In the experiments of Dr. Belcher (*Com. Board of Agr.*, vol. iv., p. 416) upon the common garden cress, by watering them with a solution of phosphate of ammonia, the plants were fifteen days forwarder than plants growing under similar circumstances, but watered with plain water; and he also describes the experiments of Mr. Gregory, who, by watering one half of a grass field with urine, nearly doubled his crop of hay. Other testimonials, in support of the fertilizing powers of the salts of ammonia, are furnished by Mr. Handly (*Journ. Roy. Agr. Soc.*, vol. i., p. 46). There is little doubt that various manures have a very considerable influence upon the composition of the corn produced from the soils with which they are dressed. 'It will be seen,' says Dr. Daubeny (*Ibid.*, v. iii., p. 147), 'that the proportion of gluten to starch, as well as the aggregate amount of the crop itself, is augmented by manuring the soil with those materials which are richest in ammonia—such, for instance, as blood, pigeons' dung,' &c.—*Farmer's Encyc.*

"In some recent experiments made with Guano, by Mr. Robert Bell of Gunsborough, near Listowel, in Kerry, the following (*Brit. Farm. Mag.*, vol. vi., p. 601), according to a communication from him, dated Dec. 20, 1842, were the results:

"I first witnessed the effects of Guano, as a powerful fertilizer, in the growth of early potatoes. By applying a little round the shoot, soon after its first appearance above the ground, a greater luxuriance of growth was perceptible in the stalk a few days after; and having added a little more previous to earthing them up in the usual way, was afterwards astonished to find potatoes quite fit for the table at the stalks manured with Guano, while those not so treated were scarcely formed, although of the same description of seed, and planted at the same time. Again, I applied it to potatoes fit to dig, the tops of which had lost their green appearance, and were of the hue indicating maturity of the root, and a few days only elapsed before they were changed to the green and growing state they were in some weeks previous; and it was found eventually, on taking up the crop, that not only were the potatoes larger, but that a second growth of tubers, of small size and very numerous, had been the consequence of the application of the Guano. These potatoes were manured, at the time of planting, with farm-yard dung.

"I tried Guano also by itself, at the rate of two and a half cwt. per

acre in drills, at one side of which were potatoes manured with a rich compost of earth and dung, and at the other with nitrate of soda of the same quantity. The crop of the whole was an extraordinary heavy one, accounted the most abundant ever seen in this part of the country; but during the summer and autumn, the haulms of the potatoes planted with Guano and nitrate of soda had a much darker green and more luxuriant appearance than the other; and heavy as the crop was generally over the field, I consider the Guano drills the best, the nitrate of soda next, the tubers being larger, several of them weighing upwards of three pounds, and not a small one to be seen. In speaking of this crop, I may observe, the land was made very fine at the time of planting, and every weed eradicated, and twice horse and hand-hoed, previous to earthing up. Immediately on the crop being lifted, the field was sown with wheat, which at this time looks beautiful, alike on the part manured with Guano and nitrate of soda as on the other.

“My next trial with Guano was with turnips; and its applicability to this crop also is strongly perceptible here. I tried it sown broad-cast on the land, afterwards drilled up lightly before the seed was sown, alongside of deep drills, with farm-yard manure applied at the rate of about twenty tons per acre, on a fine loamy soil; the braird of them with Guano was not only stronger and more regular, but the tops of turnips have continued in their fresh and green state, after a great part of the others had fallen to decay—thus yielding a greater quantity of green food for our store-cattle—and the crop was much more even and better than the other part of the field. In speaking of this crop, perhaps it were well to mention that I had sown a few drills without any manure, at one side of those manured with Guano, merely to see the difference. The seed certainly did braird, but that was all, for they scarcely made any progress whatever, and were considered as not worth the labor of hoeing; but I desired the work-girls to pulverize a quantity of Guano, and put a little round each sickly plant; and when I visited the field, some days after, I was literally astonished to see the change that had taken place: the leaves of the turnips had grown and spread so rapidly as nearly to meet in the drill, and have turned out, much to the surprise of every one acquainted with the facts of the case, a very fine crop. They were of the kind denominated Aberdeens; but I have had turnips of the white globe this season, from Guano, weighing upwards of twenty pounds, and that on reclaimed bog-land; and our Swedes are also very large; the seed I procured from Messrs. Drummond, of Stirling. It ought to be borne in mind, that turnips sown with Guano should not be thinned with the hoe, but singled out by the hand.

“The only other instance I have tried Guano in the fields is on wheat, and in this case it was mixed with mould and ploughed in previous to sowing; the wheat came up well, and has a beautiful color, with that peculiar curl which denotes a promising crop. This is in a field I have drained on Mr. Smith's (of Deanston) principle.”

The following are extracted from a pamphlet recently published.

in Baltimore, on "Peruvian and Bolivian Guano," at the office of the American Farmer.

Remarks on Peruvian Guano, as a Manure, by Hon. John S. Skinner, 3d Assistant P. M. General, late Editor of the American Farmer.

"If Alchemists had really succeeded in finding the elixir vitæ, or *lapis philosophorum*, of which they were for a long time in search, and with which it was believed to be practicable to transmute all baser metals into gold, the discovery could scarcely have made a greater noise in the world, than has been made lately in England by the results of actual and various experiments with this wonderful fertilizer called *Guano*, the excrementitious deposites of sea-birds, for ages on ages gone by, on islands on the west coast of America. If agricultural, above all other knowledge, did not travel with a snail's pace, American cultivators would have been in the full fruition of this great resource nearly twenty years ago. In December of 1824, I received and distributed two barrels of this extraordinary substance, on which the Peruvians depended for raising their crops of maize, and, in fact, for their subsistence, no one knows how long before they were conquered by Pizarro. I published at the date mentioned, in my old American Farmer, translations from Ulloa's Voyages, to show the objects and the modes of application of Guano in Peru, with the analyses made of it by the most learned French chemists. Governor Lloyd, of Maryland, an intelligent and enterprising farmer on a great scale, to whom a portion of it was sent for trial, pronounced it the most powerful manure he had ever seen applied to Indian corn,—but no measures were ever taken (until since recent experiments with it in England) to procure a further supply of it in this country. A few years since, it was introduced in England and applied to every variety of grass, grain, and culinary vegetables, with results so extraordinary, that though a great number of vessels are now employed in the trade, the supply is not fast enough to satisfy the demand.

"In our own country, too, public attention is being rapidly awakened to its virtues as a powerful and portable fertilizer. In the latter quality—its portability—may be said to consist its great recommendation; for although, making weight or measure the standard of comparison, it would appear to be the dearest of all manures, its condensation of great power into so small a bulk, renders it beyond all comparison the cheapest. The mind cannot at once, nor but by careful and extended calculations, realize the vast difference between it and stable manure, or even lime, in this respect. We must reflect upon the expense of purchase and hauling such immense bulks, if the farmer live near enough to purchase in the towns; and if too far for that, let him calculate the labor of collecting and compounding the materials, and hauling out and spreading as much barn-yard manure, as would equal it in its results the effect of as much Guano as a donkey would take at a single load. The case presents the difference in bulk and handling, that there is between essential oils and the trees on which the nuts grow, or the plants from which these oils are extracted.

"Guano has been applied with prodigious effect on all the staples alike of the garden and the field—on vegetables and vines, whether grape or strawberry, and on the whole family of *graminæ* or true grasses, increasing the first crop after its application to grass or turnips, in a manner to reimburse the outlay at once. In its application to plants sowed in *beds*, it must be particularly valuable, and in this respect it may be said to have supplied a *desideratum* to the *tobacco planter*. There need now be no difficulty in getting plants, and one cannot easily exaggerate the importance of a substance which may, in a few minutes, be applied at a cost probably of one or two dollars, and within the compass of a few rods, to that which is to be *transplanted over large fields*, forming in fact the main element and basis of the planter's chief staple crop. Its value must be immense in this respect, saving the plant, as it has been found to do, from the ravages of the fly, by pushing it beyond its reach, or by emitting an odor that repels its attacks, as that of penny-royal effectually does the attacks of the horse-fly, and tobacco-water the ravages of the worm, so destructive to the elm. Considering the small space it occupies, the trifling cost of as much as may serve for a large garden, and its easy appliance to plant-beds, to vines, to celery (on which I have seen it used with wonderful effect), on cabbages, potatoes, fruit trees, &c., it would seem that Guano must take the place of bulky manures, and by reducing the demand for, and price, especially of stable manures, in the large cities, its introduction must much promote agricultural and horticultural improvement; and thus prove a real benefaction to the country.

"So great is the rage at this time for Guano manure in England, that, as was to be expected, counterfeit presentments of the genuine article have been so artfully compounded of inferior ingredients, as to possess, like certain hypocrites, the mien without any of the virtues of the truly good. Hence it behooves the purchaser to take due precaution not to be imposed on with a spurious or an inferior article. To meet the growing anxiety for practical information as to the immediate effects and durability of Guano, the crops to which it is adapted, and the quantity and mode of application, several pamphlets have been published in England, and numerous essays, full of interesting details of experiments, have appeared in our own agricultural and horticultural periodicals—and the conductors of these, with their usual zeal and discrimination, will doubtless keep their readers advised of the results of further trials. For the first attempt to bring it into notice and use in this country, the reader is referred to the *American Farmer*, vol. 6, page 316, December, 1824: but he will find a great number of recent and striking experiments, exemplifying its efficacy, detailed in a pamphlet lately published in London, under the title of "*Peruvian and Bolivian Guano, its Nature, Properties, and Results*." From that pamphlet I here submit, as well to provoke, as in some degree to satisfy public curiosity, the General Report of the Chemical Examination of several samples of Guano, belonging to Messrs. ANTONY GIBBS & SONS, of London, and W. J. MYERS & Co., of Liverpool, by ANDREW URE, M.D., F.R.S. It need hardly be added, as to the character of Dr. Ure, that in

submitting the Peruvian Guano to be tested by him, the importers, Antony Gibbs & Son, London, and Wm. Jos. Myers & Co., Liverpool (themselves known to be merchants of the highest standing), meant to appeal at once to the highest professional authority; and it seems that the published results of experiments, since the date of his Report, have strikingly verified the Professor's anticipations of the virtues of Guano.

"Extract from the General Report of the Chemical Examination of Guano, by Andrew Ure, M.D., F.R.S. &c., London, 13th February, 1843 :

ANALYSIS.	Parts.
Azotized organic matter, including urate of Ammonia, and capable of affording from 8 to 17 per cent. of Ammonia, by slow decomposition in the soil, - - - - -	50.0
Water, - - - - -	11.0
Phosphate of Lime, - - - - -	25.0
Ammonia, Phosphate of Magnesia, Phosphate of Ammonia and Oxalate of Ammonia, containing from 4 to 9 per cent. of Ammonia, - - - - -	13.0
Siliceous matter from the crops of the <i>birds</i> , - - - - -	1.0
	<hr/> 100.0

(Signed)

ANDREW URE, M.D., F.R.S., &c.
Professor of Chemistry and Analytical Chemist.

"It is gratifying to perceive that a cargo has arrived at Baltimore, in the Orpheus,* to S. K. GEORGE, Esq., regular agent of the London house, who sent it directly from Peru, as taken from the island, with every guaranty that can be desired of its *genuineness*, not to say *purity*; and it is very important that in the first experiments there should, on that point, be no deception or mistake. In the English papers lately, the African Guano was quoted at £12, or \$60, and the Peruvian at \$80 per ton of 20 cwt. of 112 pounds, or 2240 pounds.

"I had just penned the preceding remarks, when the mail brought me the following letter from an esteemed friend, who is one among the most earnest and well informed practical horticulturists in this country. While it will be seen that it was not exactly designed for publication, it evinces a desire to be useful, which guarantees that he will excuse my giving it to the public, in furtherance of my design, after a lapse of nearly twenty years, to reinvoke the attention of American agriculturists to this very remarkable fertilizer—one by means of which it would seem that Providence designed the ocean to restore to the earth, some portion of the riches

* This cargo and one received by the George and Henry at New York by Mr. Edwin Bartlett, are the only parcels of genuine Peruvian Guano in the United States. They were both shipped by order of the Peruvian Guano Company of Lima.

carried by rains and rivers from the sides of the one into the depths of the other.

"I will only add, that while in England, where *there is some evidence of regard for the agricultural interest in the spirit of the laws*, Guano is subject only to a nominal duty, while in *this country*, whose population is agricultural as three or four to one, this substance, used only as manure, pays a duty of 20 per cent. as a non-enumerated article. It is to be hoped that it will be expressly exempted from duty by the next Congress.

J. S. S.

"P. S. Since writing the above, I have learned by conversation with Mr. TESCHEMACHER, of Boston, a gentleman whose horticultural zeal is directed by all the lights that science can afford, that it has been found on experiment made at his instance with reference to that object, that Indian corn from the grain of guanoed corn the previous year, is decidedly superior to the product of other corn, though the culture of both was this year the same in all respects. His impression is, that its influence is particularly efficacious on the quality of the grain."

"To J. S. SKINMER, As't P. M. General, Washington]

"PETERSBURG, August 21, 1844.

"*Esteemed Friend*,—Absence from home all last week, and indisposition since my return, have prevented me from acknowledging thy kind letter sooner. However much I feel complimented by thy request to furnish a paragraph or two for thy address at Wilmington,* I could not prevail upon myself to comply literally with it. I should be gratified, nevertheless, to make any suggestion of the least value. Amongst the topics which may claim thy attention, I know of none more deserving of notice, at least to all that class of farmers and horticulturists, residing in the vicinity of towns, who are in the daily practice of buying town manures, than a full treatment of the subject of GUANO. In some places manure is exorbitantly high; and even where it is lowest, as for instance here at Petersburg, where it only sells for twenty-five cents the two horse wagon load, I am convinced that Guano would be the most economical fertilizer that can be used. The labor of hauling manure from one to three miles is very great, to say nothing about the introduction of noxious weeds into our farms and gardens. Last week I spent several days at Norfolk, and really I saw some fine land so infested with nut-grass and other pests, that I would hardly undertake to cultivate it free of rent, in any crop that required nicety of management. The business by which I make my living is the growing of fruits and vegetables for the market. Counting the cost of all the manure I have to purchase, the hauling home and then spreading it and incorporating it with the ground, I believe I could at the same expense of labor and material, derive double the amount of produce by the substitution of Guano. I have made some experiments this year which satisfy me of its

* Alluding to an Address to be delivered at Wilmington, by Mr. S., next month, at the request of the Delaware State Agricultural Society.

great value and economy : and I am gratified to find that even in such a place as this, where the light of improvement breaks slowly in upon the minds of the people, like the sun shining through a thick mist, that considerable use is now being made of it in this neighborhood.

"I think a full treatment of this subject would not only be opportune and productive of great benefit, but it would come with peculiar appropriateness from one who, if I am not under some misapprehension, was the first to introduce Guano into this country. I have been requested by some of my neighbors to furnish a short article on its use, for our local paper ; and in looking into the subject I may possibly have collected some facts which might be useful. The most authentic work, however, to consult, is Prof. Johnston's Lectures on Agricultural Chemistry, in the Appendix to which a great number of experimental results are detailed.

"Let me make a little calculation of the relative value of Guano and other manures, to suit my circumstances—and which, with some modification, would be applicable to others pursuing the same business :

33 wagon loads (2 horse) of manure to the acre, at 25 cts. \$8.25

Hauling, 11 days, with team and driver, finding, &c., at

least \$1.50 per day, - - - - - 16.50

—24.75

30 bushels bone-dust, per acre, at 55 cts., - - - 16.50

300 lbs. Guano (about the average of what is used in England) at 3 cts., - - - - - 9.00

Or, 400 lbs., which is considered a bountiful dressing, - 12.00

"The cost of applying the manure would be several dollars more, while the Guano or bone-dust might be spread at very little expense. But I will trespass on thy patience no longer. Very truly thine,

"T. S. PLEASANTS."

—
"LAUREL FACTORY, August 26th, 1844.

"MR. SAMUEL K. GEORGE :

"*Dear Sir*,—Your communication of the 19th instant, on the subject of Guano, was duly received, but pressing engagements have prevented me giving you an earlier reply.

"Most of my experiments in Guano were detailed in my letter to John S. Skinner, published in the *American Farmer* of June last. But as this article (Guano) seems to be growing rapidly into favor, I take pleasure in communicating to you still further the result of my experience in its effects as a manure.

"The application of it to my wheat crop was made in the month of April, as a top-dressing upon spots where there was but little appearance of vegetation. The effect was powerful, both in the straw and in the seed. I also tried it in various ways on my oat crop ; by itself on very poor land, and mixed with ashes and other manures. Where applied alone upon poor, old field, at the rate of about 250 pounds to the acre, the product per acre has been estimated as high as 40 to 50 bushels—30 bushels I should think within bounds. I have not been able to thresh it out, although I

have had it stowed away by itself, and the land measured off, to test its efficacy. The land in both cases is a (rather) stiff clay loam. My own opinion of the Guano is, that if it be found at all permanent in its effects, it will prove the cheapest and most effective manure now used. Its stimulating effects, no one can doubt who tries it. Care must be taken in all cases not to apply it so as to bring it in immediate contact with the seed before germination takes place. It can be rolled in, after having previously harrowed in your grain, or sown broad-cast as a top-dressing after the grain is up, or mixed with the soil some time previous to seeding. The first method is probably the most judicious. Where you follow rolling in your clover seed, after harrowing in your grain, one of the two latter methods had better be adopted, as I find it, in one instance where rolled in with clover seed, to have stopped the germination of it almost entirely. Another and very safe way of applying it is to mix it with other materials, such as plaster, woods-earth, &c., in proportions of one of the Guano to six or eight of the latter. This is more troublesome, and need not be resorted to, excepting when sown immediately with seed. Yours, very truly,

H. CAPRON."

Extract from a Letter from Francis Finch, Esq., of Plum Point, Cecil County, Md., to George Law, Esq., Baltimore, dated 5th July, 1844.

"I used the Guano pure on corn, on old field land, and certainly the vigor of growth was greatly increased by its application.

"I used it mixed with gypsum; $1\frac{1}{2}$ bushels gypsum to 1 cwt. Guano, and sowed it at the rate of one hundred weight and the plaster, to each acre, on a field of Mediterranean *wheat*; the land was two years ago old field, had had no manure but a dressing of lime, before putting in the wheat. A few days after the application of the Guano, a manifest improvement in the color of the plant was observed, and at maturity the crop surprised my neighbors and my manager.

"I have tried Guano on potatoes against barn-yard manure—thus far, the superiority of the Guano is most striking—the color a deep green, and in blossom a week earlier."

From the Petersburg, Va., Intelligencer.

"ON GUANO.—The following is from the pen of one of the most enlightened agricultural writers in Virginia, a gentleman who combines practical knowledge with very high scientific attainments:

"The experiments that have been made with Guano in the United States have been very satisfactory as far as they have been reported; but it is only in Great Britain that accurately conducted experiments, to test the relative value and economy of all kinds of manures and salts, have been published. In Professor Johnston's work, the whole subject of manures is fully treated.

"The application of Guano is as simple as that of any other manure ; and since it is known to act powerfully on all soils, from the arid regions of Peru to the humid climate of England, it must of necessity be a great fertilizer in our own country. Its greatest effects are said to be on sandy soils. The mode of application depends very much on the crop which it is designed to benefit. On grass lands, and in the cultivation of the cereal grains, it should be sown broad-cast ; but for all vegetables grown in hills, or drills, it should be applied in close contiguity to the seed, though not in direct contact with it in its concentrated state. Top-dressing, after the seed is planted, is perhaps the most advantageous mode, provided a copious rain immediately follows ; but as this cannot always be counted upon, the safest practice will be to chop it in the hill or drill, mixing it freely with the soil. Lying on the surface, exposed to the action of the sun, the ammonia and other volatile ingredients would soon escape ; but mixed with the soil, they combine with it, and remain ready for the use of plants whenever there may be sufficient moisture to dissolve the Guano. In England it has in a great degree superseded the use of bone-dust for turnips, and for potatoes it is no less valuable. In our own country, its effects on Indian corn have been very striking ; and for all horticultural operations, especially in the vicinity of towns where gardeners, and even farmers, are in the habit of buying manure, the Guano recommends itself no less on the score of economy than for its intrinsic value."

"In England it is applied at the rate of from 2 to 3 cwt., and sometimes even as much as 5 cwt. to the acre, but 3 cwt. is considered a good dressing. The writer of this has made some experiments this year on turnips and celery, and is well convinced of its value from his own experience. He has found 300 pounds to have a greater effect on turnips than 100 horse cart loads of the best stable manure to the acre. For a year or two he has tried it on plants growing in pots, such as geraniums, roses, &c., and the effect of a single teaspoonful has been wonderful. This is mentioned for the benefit of the ladies, who, 'themselves the fairest flowers,' are always appropriately employed in nursing these gems of the vegetable creation. For such purposes the Guano should be dissolved in water. In no case should the powder be permitted to come in contact with the tender leaves of plants of any kind."

"Dr. Jackson of Boston, an eminent scientific authority on this subject, states, 'that so far as regards the application of Guano, it is especially adapted to those varieties of soil which are deficient in saline ingredients, and to those having merit or insoluble vegetable matters. It is not required on rich mould containing animal and vegetable manures, and where ground bones have been largely used, for these manures convey to the soil similar ingredients to those found in Guano. Our light sandy loams will, without doubt, be found to be the best soils for its successful application.'

"The present price of Guano places it within the reach of all those who are in the habit of purchasing town manures ; and perhaps not the least of its advantages will be in the security against the introduction of noxious weeds into our farms and gardens."

On the comparative value of Guano with other manures, Dr. Gardner makes the following sensible remarks :

“Guano contains the same components as stable manure, excepting only the vegetable rubbish ; but is in a very condensed form ; for whilst the latter averages only one-half per cent. of ammonia, Guano sometimes contains upwards of 20 per cent. They also both consist of phosphates, and saline matters. It is therefore required to know, before we estimate their comparative value, to which of their ingredients the fertility in any given case is owing ; in turnip crops, which are notorious for the fresh manure they require, 100 lbs. seem to be equal to about eight tons ; on grass, 100 lbs. equal six tons, and on wheat, 100 lbs. equal only four tons of stable manure, in an admirable experiment at Wrexhall. In these cases, as is well known, the wheat requires phosphates and potash pre-eminently, and turnips ammonia. We may therefore, in practice, form an estimate by remembering that the remarkable character of Guano is due to the quantity of ammonia it contains, and that its effects will rise in comparison with other manures, as the crop is more or less partial to that body—but is always beneficial from its other components. To assist the memory, I will throw together an estimate for various crops.

“The highest value of Guano will be seen in turnips, Swedes, cabbages, rape, tobacco, potatoes, flax ; the lowest on oats, wheat, corn, barley, and grasses.

“*The soil being similar in all cases*, as an average, 100 lbs. of Guano may be said to equal five tons of the best stable manure. It will be understood that rich soils have much less necessity for ammoniacal manures than poor lands ; hence Guano shows its greatest action on the latter.

“As to the comparative value in money, it will depend upon the price of manure ; the English estimates given are at the rate of 5s. sterling the ton. It commands 62 cents a load in New York city, and certainly cannot be produced on the farm for so little.”

From the American Agriculturist, Nov., 1844.

“GUANO MANURE.—Guano, whether from Peru or Africa, may be separated into two marked and important kinds of ingredients : the volatile, or easily evaporable, and the fixed or permanent ingredients.

“The volatile ingredients are those which evaporate readily at the common temperature of the atmosphere, which contain the ammonia of the Guano, and are the nitrogenous, or azotized ingredients. They consist chiefly of carbonate, oxalate, phosphate, and *humate* of ammonia ; they are contained in all barn-yard and stable manure, and are of the utmost importance to vegetation, for there is not a portion of the vegetable without nitrogen in some shape or other ; they powerfully excite vegetable action, and are consequently indispensable to produce a luxuriance of growth. It is to this azotized ingredient that is chiefly to be attributed the surprising *growth* of plants watered with a solution of Guano ; for nearly all these ammoniacal

ingredients are soluble in water. Before I quit this subject, let me say a few words on the humate of ammonia.

"Of all the nitrogenous compounds, this retains the ammonia with the greatest tenacity—humus is found in all soils which contain organic matter. What a wise provision of nature, that an ingredient in almost every soil should be able so tenaciously to retain the substance indispensable to vegetation, ammonia, which is poured down in every shower of rain, exists in every flake of snow! The plants have the power to extract it from its combination with humus, then, just as they want it, and the rich manure of snow water is no longer a fable; for the ammonia is retained in the snow by the coldness of the temperature, until the genial warmth of spring sets it free to promote the growth and vigor of the young year. One of the most valuable ingredients, therefore, of Guano, is the ammonia, or rather the ammoniacal salts, and by the quantity of these its price in Europe is very much regulated. The best Peruvian Guano contains thirty to thirty-eight per cent. of these salts—some from Chili is quite inferior, and only contains eight to twelve per cent.; the best Ichaboe from twenty to twenty-seven per cent.; the cargo of the Samos, just arrived from Ichaboe, contains twenty-six and one quarter per cent., and is a very superior parcel. It has been stated by Dr. Davy that he was unsuccessful in finding uric acid in the African Guano; I have found it, and I see by recent analyses from England, that it has been found in many parcels to the amount of 1½ per cent. This is by no means an extraordinary circumstance; this substance and its immediate combinations are rapidly and easily transformed, naturally when moistened, or during the process of analysis, into carbonate of ammonia, &c. The character of Dr. Davy as a chemist forbids any other supposition, than that in the samples he analyzed, this transformation had taken place previous to their being placed in his hands.

"The latest discovery respecting this portion of Guano, is by a German chemist, Unger, who has found in it that exceedingly rare substance, the *Xanthic oxide* of Marcet, hitherto only found, in very small quantity, in urinary calculi. This, although of no agricultural importance, is extremely interesting to chemists and physiologists.

"The next to be considered are the fixed or permanent ingredients. These may again be divided into two kinds, those soluble, and those insoluble, or nearly so, in water.

"Those soluble in water are chiefly salts of potash, as phosphate, muriate, and sulphate of potash. I trust that agricultural chemistry is so generally understood now, as to make it unnecessary for me to discuss here the value of potash to the farmer; he knows that this or soda exists in every manure. In the quantities of these ingredients there does not seem to be much difference in the Peruvian or best African; there is usually ten to fifteen per cent., more than this I think would hardly be advantageous. By this division of ingredients the farmer may know what he adds to his soil in using a solution of Guano in water. Such solutions should never be stronger than one pound of Guano to twenty gallons of water, and may be used where convenient three or four times during the *growing*, not the *ripening* season.

"We now come to the last division of ingredients, those insoluble in water, or nearly so.

"They consist chiefly of the phosphate of lime and of magnesia, and the oxalate of lime. These substances, although insoluble in plain water, are soluble in many of the liquids and compounds they meet with in the soil, and when in contact with the roots of plants. They are of the greatest importance to vegetation, for two of them are contained in the seeds of all cereal grains, and particularly in the embryo plant or plumule of the seed. They are contained in exceedingly small quantity in the usual manures, and hence the fields in England which have been so severely taxed for them by the incessant taking off of wheat crops, could yield them no longer until replenished by bone manure and phosphate of lime. The quantity of these in Guano varies much, say from 20 to 40 per cent.; about 30 per cent. is a very good quantity. Beside these ingredients there is generally moisture or water, varying from 10 to 30 per cent. On this subject it seems only necessary for me to say, that the less water the better, not only because it is the least valuable ingredient, but because water rapidly decomposes the ammoniacal compounds.

"The intelligent farmer, from knowing the quantity and quality of the ingredients of his manure, will be better able to shape his course in the application of them, a subject on which of course much experience is still desirable with Guano. I have written strongly to Mr. Colman to send us over all the information he can collect on the subject, and I have not the least doubt of its being placed before our farmers in his work, in sufficient time to direct the spring operations.

"From what has been said, then, it appears that if a growth of stem, leaf, and root, be required, the solution of Guano is about as useful as the whole substance; but where a seed crop is wanted, the insoluble ingredients above are requisite, and the whole Guano is necessary. Several experiments have been made here on grass lands, after the first mowing; they have not been very successful, and the reason is obvious. The Guano has been spread over the grass, and in cases where it has not rained immediately, the ammonia has evaporated in the air, and even in cases where rain has followed, much of the ammonia must have evaporated before the solution could get through the thick matted stems to the roots. The potash and other fixed salts may, however, probably be of use in the ensuing spring, but hardly sufficient to warrant any expensive outlay. Permit me here to observe to the farmer, that an unsuccessful experiment, well conducted, is often as instructive as a successful one, and therefore may equally lead to profit. The seed corn which I grew with Guano last year has been tried against the best that could be purchased of the same kind, and under precisely the same circumstances, side by side: the Guanoed corn was strikingly more luxuriant, and yielded the largest crop.

"The whole result of my experiments this year, has, if possible, strengthened my estimation of the valuable power of the Guano, and my view of its application generally is, that 250 to 300 pounds is sufficient for one acre broad-cast; that it should be put into barrels and be kept as close as possi-

ble,* that when applied, no time should be lost in covering it with the soil, so that when the ammonia escapes it may at once impregnate the soil above it, which will then gradually give it off to the plant.

"Pumpkins of enormous size, grown with Guano, have been exhibited this year, at the Massachusetts Horticultural Society, and many of those who have tried it on various vegetables, are full of wonder at its power. I think it not so likely to answer so well in stiff clay as on light soils; but one of the great objects of the farmer ought to be to lighten his stiff soil with sand, and then it may be used. On grape vines and all gross feeders, its effects are surprising. On fruit trees, one conspicuous action is, that it shortens the joints between the leaves, making the growth short, stumpy, and therefore productive. As it excites vegetation at any time of the year when the atmosphere is of a temperature to permit growth, it must not be applied except during the growing season; but for forcing fruits or flowers, out of season, it will be very serviceable. I have heard from several here, that its effects on potatoes have been remarkable; but I can say nothing on this subject from my own experience. I think the African Guano, generally, is not so retentive of the ammonia as the Peruvian, nor does it usually contain quite as much; but the difference of price amply makes good this difference, if skilfully and carefully used.

"J. E. TESCHEMACHER.

"*Boston, 1st October, 1844.*"

From Hovey's Magazine, April, 1844.

"*Guano; its action upon the growth of various Plants, Fruits, &c.* By J. E. TESCHEMACHER, Corresponding Secretary of the Mass. Hort. Soc.—I have already stated that I had numerous experiments in progress, which were destroyed by fire; as there is no prospect of my resuming them at present, I will offer a few ideas upon which several of them were based, in order that those who have leisure may pursue them. The ultimate object of vegetable life appears to me to be the production of seed: to this purpose, and to accumulate the properties and ingredients for the formation and perfection of this seed, the root, stem, leaf and flower are devoted, each performing its destined gradual part, until by their united efforts, brought into action by soil, light, heat, and moisture, this object is attained; exterior vegetable action then declines until another season. Experiment has shown that plants grown on mere sand, with the assistance of water, will throw out stem, leaf and flower, nay even the forms of seed—but these will be mere integuments, empty vesicles, or little bladders; also that, by constantly stimulating with peculiar manure, we can throw plants into such uninterrupted luxuriance of shoots and foliage, that often the flowers, and

* This remark is more applicable to the African than to the Peruvian Guano, for the former being more moist than the latter, the escape of ammonia from exposure is much greater. The Peruvian is not found to deteriorate much in quality, when kept in large quantities in bulk, or in smaller quantities in bags.

more often the seeds, do not appear within the limits of the season. Combining these views with others on the production of double flowers, and with some suggested by various experiments on Guano, it seems to me highly probable that certain manures are particularly conducive to a luxuriant growth of stem and foliage, while others are peculiarly so to the production of numerous and well-filled seeds. As it would be impossible for me, at the present moment, to develop all my ideas and experience on this subject, I will endeavor briefly to elucidate it by a supposition, which, like those in algebra, may or may not be near the truth.

"Suppose the nitrogenous (*ammoniacal*) and alkaline (*potash and soda*) manures to be those chiefly instrumental in producing stem and foliage, then nitrate of soda will be valuable for this purpose, and if the soil itself contain the ingredients of the seed in a fit state for absorption, the plant thus thrown into a state of luxuriance will be enabled to draw from it sufficient to make plenty of good seed. But if the soil in itself contains them very sparingly, then this excess of stem and foliage, although containing a quantity of nitrogenous and palatable food for cattle, will be deficient in rich seed. Now we know that phosphate of lime and of magnesia, with sulphurous compounds, exist in all seeds useful to man and animals; these, however, do not form part of nitrate of soda and potash—hence the latter can only assist the plant in extracting them from the soil.

"Suppose, secondly, we use a manure combining the nitrogenous principles in the shape of urates, &c., with the alkaline phosphates, sulphates, muriates, &c., then, even on the poorest soil, while the ammoniacal portion is performing its office of causing luxuriance in foliage and stem, the ingredients of the seed are offered in abundance to the root. This is exactly the predicament of Guano—most of the salts in which are soluble in water; and those which are not, such as the phosphate and oxalate of lime, become so when combined near the roots with the carbonic acid furnished by the humus, as well as by other portions of the manure.

"The use of a solution of Guano in water is therefore good, when the seed is not required; but where it is, the deprivation of the insoluble phosphate of lime is very injurious.

"Hence, from the proper use of Guano, a luxuriant vegetation is followed by the production of a large crop of fine seed. As a further elucidation of my views, I will state that the manure made use of for the purpose of producing double flowers, is the highly nitrogenous stable manure, which is used in such quantity as to prevent the roots from coming into contact with that part of the soil containing the ingredients of the seed—this manure being then chiefly favorable to the production of foliage alone, if continued through many generations, will by degrees convert the stamens, pistils, and the parts destined by nature to prepare the seeds, into leaves or petals, and finally obliterate the seed. These flowers, if grown in a poor soil, scarce in nitrogenous substances, will again, as is well known, revert to their normal single seed-bearing state.

"Several of my experiments with Guano proved to me that it shortened the internodes, or portions of the stem between each leaf; this was par-

ticularly evident in seedling orange and lemon trees, and is a sure indication of fruit or seed-bearing ; indeed the spurs, which are well known as the fruit-producing parts of many trees, are but shortened branches where the internodes are reduced to a mere nothing, and where, consequently, the auxiliary action is concentrated into a small space. I have, therefore, no doubt of the beneficial action of Guano on fruit trees. Many experiments are, however, yet desirable :—such as whether Guano acts beneficially on the receptacle of the seed, which is the fruit of the strawberry and raspberry ; whether on the exterior covering of the seed, which is the apple, peach, plum, &c., or on the kernel or nut, or on the pulpy envelope of the seed, as the gooseberry, grape, melon, gourd, &c. I hope that these ideas will give rise to numerous experiments this year, and that those who make them will not hesitate freely to communicate them for the general benefit.

“ I will merely add, further, that I should consider it advisable, in all experiments on fruits, to try both the Guano itself, as well as a weak solution of it in water ; it is highly probable that the solution will be efficacious where the receptacle or the exterior of the seed is most valuable, whereas in corn, peas, beans, &c., those phosphates which are insoluble in water, and are very necessary, would be thus lost to the plant.

“ At another period I may possibly resume this subject, as it seems to me that these ideas open new views on the physiology of plants, and certainly show of how much importance it is for those who study this subject to become better acquainted, from personal observation, with the action of the soils on vegetable life. It is from the want of this knowledge, that the greatest errors have been proposed and propagated as truths, by scientific men.”

From “Three Years’ Experience in the use of Guano,” by Thomas Baines.—Liverpool Times, Nov. 1844.

“ Having begun to use this new and much-spoken-of manure the year after it was introduced into this country, and having continued to use it in increasing quantities ever since, it may perhaps be useful both to the commercial and farming interests that I should give a brief and plain statement of the results of the many trials that I have made of it, on different crops. The present condition of the farmers of the United Kingdom is such as to make it of equal consequence that they should not neglect any real improvement in cultivation, and that they should not waste their money in any doubtful or expensive experiments. What they want to enable them to pay their rents, to employ the laborers in their respective parishes, and to support their families, is an increase in the produce of their farms, and that to be attained in a single season and at a moderate expense. All these things I am convinced, from three years’ experience in the use of Guano, they may obtain more surely by the judicious use of this new, but well-tried manure, than by any other means. So fully am I persuaded of its value, that after having increased my consumption of it from three or four cwts. in 1842, to upwards of twelve tons in 1844, I am prepared to use double

that quantity next year; and this I know to be also the intention of my next neighbor, who began to use it about the same time that I did, and who has also found it to succeed as completely as I have. At the present time we have between us about forty acres of turnips growing on our farms, raised without a spade-full of any other manure than Guano, and which I believe are not to be surpassed by any crops of the same kind in Lancashire or Cheshire. Dry and unfavorable as the season was for all kinds of green crops, and especially for turnips, we have neither of us lost a drill of them. This I attribute almost entirely to the use of Guano, in my own case, for, owing to the condition of the land, which had been lately marled, we were obliged to sow later than usual, and in such a season as the last, nothing could have secured the crop from the drought and the fly except the rapid and vigorous vegetation of the seeds, from the effects of the Guano.

"I need not tell any one acquainted with cultivation, that there can be no good farming without a well-arranged system of green cropping. The four-course system of husbandry, which has made the once barren sands of Norfolk and the wolds of Lincolnshire, the granary of London; and the five-course system, which has rendered the cultivation of Northumberland, Berwickshire, and the Borders, the admiration of all beholders, both rest upon the turnip crop as their foundation, just as the Flemish system of husbandry rests on the cultivation of clover, rape, turnips and carrots; and that of Lancashire on the cultivation of the potatoe. Now my own experience, especially during the dry summer of the present year, when the turnip crop has failed almost entirely in the South and Midland counties, and to a great extent in Lancashire and Cheshire, convinces me that Guano is the most certain of all manures in raising turnips; and when it is considered that it has been shown by one of the most skilful agriculturists of the present day, I mean by Mr. Morton, in his report to Mr. Pusey, published in the Transactions of the English Royal Agricultural Society, that the loss of an acre of turnips is, in its results, equal to a loss of fourteen pounds to the farmer, it is not easy to overstate the value of the manure which will render the cultivation of this valuable root more certain, and will enable the farmer, at a trifling expense, to carry turnip husbandry to an extent which, without it, is impossible. Even on a thoroughly well managed farm, the quantity of manure formed on the spot is insufficient to keep the land in the highest state of cultivation. Hence in Norfolk, rape and malt-dust, and in Lincolnshire and the Lothians, ground bones, are extensively used in cultivation, whilst in Flanders the manufacture of manures is a regular trade. None of these artificial manures are, however, so cheap, so portable, or so rapid in their results as Guano, and therefore none of them are so well calculated to meet the wants of the English farmer, who requires a quick return, and cannot afford to pay much for it.

"First, as to cheapness. The African Guano is now selling at from five to six pounds per ton, and the Peruvian at ten, so that after leaving a fair profit to the retailer, the former may be bought at seven or eight shillings per cwt., and the latter at twelve, or with a little arrangement among the farmers of an estate or a parish, it may be bought at wholesale prices.

Viscount Hill has within the last month bought upwards of eighty tons of Guano in the Liverpool market, for the use of his tenants, whom he supplies with it at the wholesale price, thus giving them the advantage of greater cheapness and a better selected article; and I see it is stated in the *Chester Chronicle* of Friday last, that Lord Mostyn had bought a whole cargo for the use of his tenants in North Wales. These large purchases of Guano by landowners equally distinguished by their love and their knowledge of agriculture, are strong testimonies of its value as a manure, and this mode of supplying their tenants with it is deserving of the attention of other landlords. Guano bought in this manner does not cost more than from six to eight shillings per cwt., when put into the land, and as five cwts. per acre is quite sufficient, the whole cost for manure would not be more⁺ than from thirty-six shillings* to two pounds per acre. This is not one-third the cost of dressing the land with the ordinary manures. I have, at the present time, a crop of turnips manured with thirty tons of town manure, growing in the same field as a crop manured with five cwts. of Guano. They are both very good, but it is impossible to tell where one ends and the other begins, although the Guano only cost £2 10s. per acre, whilst the other manure cost £7 10s.

"In point of portability there is scarcely anything that can compare with it, and those who have been in the habit of carting the common manures even from a moderate distance, need not be told how great is the loss of time both of men and horses, and the wear and tear of carts, horses, and gearing, in that kind of work.

"It is most easily and rapidly applied to the land. This, besides being a great saving of time and money at all times, is often the saving of the crop in dry and difficult seasons like that of the present year. All the difficulty in growing turnips is in getting a good start, and that depends chiefly on two things, the first on there being a sufficient supply of moisture in the ground, and the second on the manure acting rapidly on the seed. Now no other kind of manure acts so rapidly as Guano, and none can be applied so precisely at the time when it is wanted and will be most useful. There are generally one or two times in the season when the ground is neither too wet, nor too dry for sowing, and very frequently there are no more. That was the case last year, and as five acres of land can be dressed with Guano in less time than one can be manured in the common way, the chances that the seed will have sufficient moisture to germinate are increased in the same degree. This year I have seen several instances where a difference of two or three days in the sowing made a difference of a month in the crop, and some in which it made all the difference between its doing very well and failing entirely. In wet seasons, Guano is quite as much superior to heavy manures as in dry, for in wet seasons the ordinary manure cannot be carted on the land without filling it with ruts, and rendering it stiff and sodden during the whole of the year.

* The currency alluded to is sterling, so that the *shilling* is about *twenty-five cents*.

"Guano is not less applicable to other kinds of green crops. With beans I have found it to give great luxuriance in growth, and abundance of corn, and with potatoes as large a return as three times its cost of black manure. This year I tried five cwts. of Guano side by side in the same field with thirty-five tons of town manure, and though both the crops were excellent, that raised with Guano was decidedly the best, although it only cost £2 10s. per acre for manure, whilst the other cost £8 5s.

"As a top-dressing for wheat and oats I have found Guano to be of the greatest value. If sown along with wheat, at the rate of a couple of cwts. to the acre, it produces a strong and rapid vegetation, causes the plant to take firmly hold of the ground, and saves it from being thrown out by frost and thaw, or destroyed by the nibbling of rabbits or hares. Where the seed is drilled, or where it is put in with the dibble, the smallness of the number of plants renders it doubly important that every plant should survive the winter, and nothing contributes more to this than giving it a good healthy growth and a strong root before the cold weather sets in. This a moderate dressing of Guano sown along with the seed will always do. Many persons, however, prefer applying it in spring, just when vegetation is again becoming active, and this I have also found to answer well, and to repay much more than the cost of the Guano; but care should be taken not to apply it too freely at this season, lest it should cause the wheat to run too much to straw. In the growth of oats I have found it particularly useful. Last year (1843), my land dressed with Guano gave an immense crop, and though it was less effectual this year, owing to the extreme dryness of the season, which in many places ruined the oat crop altogether, yet it gave the oats a vigorous growth early in the season, and produced me a fair return. I can say nothing of its effects on barley from my own experience, as this is not a district in which barley is grown; but the fact of the tenants of Viscount Hill using it to so great an extent, in the fine barley lands about Hawkstone, is a strong proof of its value in the growth of that kind of grain.

"The last point to which I shall refer is the use of Guano on grass lands, When applied at the proper time, that is to say, during or just before rain, it produces a very luxuriant growth of grass, and very heavy crops of hay, but if put on when the weather is dry is of very little use. For this reason it failed in many places in the season just ended, especially where it was put on late, after the drought had set in. In this, however, it only resembled all other kinds of manure, and, therefore, nothing can be reasonably inferred against it from that circumstance. Early in the season the grass land on my farm, and the adjoining one, which were dressed with Guano, promised to give a very large crop, and although this promise was not fulfilled, owing to the dryness of the season, yet the lands dressed with Guano did much better than those that were not dressed with it. Some complaints have been made of its effects on the hay, but these, I believe, have proceeded chiefly from cow-keepers and other persons having an interest in other kinds of manure, for I never saw the least unwillingness to eat Guanoed hay amongst the cattle, horses, or sheep on my own farm, or heard the slightest complaints from any of the numerous persons to whom the hay grown on it, and dressed with Guano, was sold.

"It is stated as an objection to Guano, that its good effects only last a single year. This is not correct, for even when the crop is sold off the land (which is contrary to all sound principles of farming), the effects of the Guano may be seen on the two succeeding crops, and when it is consumed on the land, no other manure is necessary to give excellent crops of oats, clover, and wheat, in the succeeding years of the rotation. In this county, where potatoes are raised for the market, one dressing of Guano would not be sufficient to carry through the whole rotation of crops, but by supplying smaller dressings to the succeeding ones, say 2 cwt. to the oat crop, 1 cwt. to the clover, and 2 to the wheat—that is, by applying half a ton in four years—I have no doubt that the whole of the crops will be excellent. We have tried it on three successive crops in this manner, with the most favorable results. In this respect it greatly resembles the liquid manures of Flanders. It acts with the same rapidity and energy as they do, and though it requires to be renewed when the crop is not consumed on the ground, it is still one of the cheapest manures in existence, even if renewed every year. To the farmer, especially one of small capital, it is a very great advantage to be able to apply his manure gradually in the course of a rotation, instead of being compelled to bring the whole of it on the ground at once.

"The method of applying the Guano, which we have found the best, is the following:—After thoroughly cleaning the land for turnips or potatoes, we apply the Guano broad-cast, at the rate of three cwt. to the acre, harrow it well in, and then raise the earth into ridges. This diffuses the Guano equally through the soil. When the plants have got well up, have been well cleansed, and are ready for earthing up, we apply a second dressing of two cwt. in the same way, that is, spreading it equally over the land, and then bringing the earth which contains it round the plants. It is better to apply the Guano at twice than all at once, and much better to work it through the soil than to place it at the bottom of the drill. When applied in the latter manner, it very frequently kills the young plants by over-gorging them with nourishment, and leaves those which survive with a very insufficient supply in the latter part of their growth. In dressing wheat, it is also very desirable to apply it at twice, rather than all at once.

"Before I conclude, I may just say a few words about the different kinds of Guano, and about the frauds which are said to have been practised in the sale of the article.

"The South American is undoubtedly the best sort, being drier and freer from impurities than the African. This, however, does not prevent the African from being an excellent and cheap manure. Some of the finer cargoes come near the Peruvian, whilst others are much inferior, and, owing to these differences in quality, Guano ought never to be bought or sold without a certificate, stating the quantity of nutritive and soluble matter which it contains.

As for the alleged frauds, they have in general been practised on persons who were determined to have the article below the market price. There has never been any difficulty, nor is there now, in getting a good article for

a fair price ; but those who will buy Guano, retail, for less than it is sold wholesale (which was the case in many instances last year), have very little right to complain, even if they are cheated."

From the "Gardener's Chronicle."

Experiments with different Manures on the Potato Crop, by Mr. W. Smyth, Michelstown, Kells, 1843.—The following experiments on the application of various manures to the potato crop were tried last season, and as the mode of culture adopted differs from the usual practice, a few words of explanation on that subject are necessary. The land is of very superior quality, consisting of a moderately tenacious clay, through which a considerable portion of an impure carbonate of lime is interspersed, part of which is incorporated with the soil, and part occurs in the form of small stones, which, however, are rarely of such a size as to form an obstacle to the operations of tillage. It had been previously many years in grass, and being merely marked out into ridges by the common plough, the potatoes were planted on the surface without any manure. The practice is well known throughout a great part of Ireland; and it is also usual to let the land in this state to produce a crop of potatoes to the neighboring cottagers, and from £4 to £6 per acre are frequently obtained for this purpose. This is the con-acre system, which has at different periods attracted public attention, as one of the causes for much of the pauperism in this country; but to this subject it is not necessary to make any further allusion in this place. The potatoes were planted on the 15th of April, and were of the variety called cups, which I believe are generally known. The ridges are five feet wide, five sets being placed across the ridges, being thus nearly a foot distant across, and nearly eighteen inches in the other direction. These were covered about three inches deep with the earth out of the furrows. Before the young shoots had reached the surface through their covering the various manures were spread on the surface in the proportions stated below. An additional covering of earth, two inches deep, was then put over the ridges. The application of the manures and the covering of earth took place the same day, on the 20th of May. On the 15th of June the spaces between the rows across the ridges were loosened by the hoe, and drawn up to the stems of the plants, forming, in fact, drills as it were across the ridges. The potatoes were taken up on the 10th of October, and the following table exhibits the results:—

Kind of Manure.	Quantity applied per acre.	Produce per acre.		Cost of application.		
		Tons.	cwt.	£	s.	d.
1. Guano, : : : :	3 cwt.	19	11	2	2	0
2. Bone-dust, : : : :	18 bushels.	15	13	2	5	0
3. Nitrate of soda, : : : :	2 cwt.	16	19	1	16	8
4. Nitrate of potash, : : :	2 cwt.	15	5	2	14	0
5. Muriate of ammonia, : : :	2 cwt.	17	15	2	15	6
6. Salt and quicklime in equal quant.	8 cwt.	14	17		12	0
7. Farm-yard manure, : : :	10 tons.	16	3			
8. No manure applied, : : :		13	10			

The farm-yard manure was that of the preceding season which had remained over in the yard, and was therefore well decomposed. Each of the other manures was mixed with a small portion of dried earth a few days before being applied. The common salt was obtained from a provision store, and contained a considerable portion of animal matter, as blood and pieces of fat, though its effects in combination with the lime were not very great. The whole of the manures applied were successful in so far as having considerably overpaid the original outlay. Another circumstance I may here mention as worthy of observation: The produce of two equal portions of the crop, to which no manure had been applied, the earth in the one case having been hoed between the plants and drawn up to their stems, and the other not, showed clearly the advantage of the former treatment, the difference in produce being no less than one ton and three quarters per acre. This work was performed by boys and girls, under the superintendence of an experienced laborer, and the entire outlay did not exceed 7s. 6d. per acre. It is not perhaps necessary to add that the statute acre is that referred to in the preceding remarks, although here all calculations are made in plantation measure of 49 square yards to the perch.

OBSERVATIONS ON SOUTH AMERICAN AND AFRICAN GUANO.

By JOHN DAVY, M. D., F. R. S., London and Edinburgh.

"AT the present time, when the attention is so much given to agricultural improvement, and such great exertions are making to increase the productiveness of our own soil, to meet, as it is to be hoped, foreign competition, the discovery of great deposits of concentrated manure, such as the Guano is, may be considered as peculiarly fortunate and encouraging.

"As we have few or no good accounts of the localities, and as they are very curious and peculiar, I shall insert a description of one instance in particular—viz., that of an islet from which some African Guano was taken, the composition of which I shall have to notice further on.

"The island from whence the Guano is taken is about three miles from the shore, on the south-west coast of Africa. It is a barren rock, about a mile in circumference; has no soil, or the least sign of vegetation. The Guano lies to the depth of about twenty feet, and without any variation in quality. The continent is very sandy, and in high winds (hurricanes, for instance), will cover a ship's deck nearly 100 miles from the land. The birds on the island are a kind of penguin, and cannot fly to any distance, if at all, their wings being a kind of fin. It is believed that the captain of the vessel who brought the Guano was the first human being who set foot on the island, which is very difficult to approach, there being no harbor and a heavy surf. On walking on it, he could scarcely set his foot without treading on the birds, and they took no notice whatever of him, except pecking at his feet, he being barefoot; and on a gun being fired, they merely fluttered a good deal, and made much noise. There is no fresh water, it is believed, for some hundreds of miles along the coast, and no rain."

"For this interesting and simple account I am indebted to a friend, who obtained it from the merchant, the importer of the Guano.*

"As, in consequence of the increasing demand for Guano, and its high price as manure, there is great temptation to adulterate it, or impose a spurious compost in imitation of it; and which, indeed, is said to be practised already to a considerable extent, any precise information respecting the genuine article can hardly fail to be useful. With the hope of contributing something of this kind, I have examined both the American and African Guano, comparing them together; and I shall now briefly state the results, premising a slight notice of their appearance.

* Mr. John Rae, South Castle Street, Liverpool.

"Both, when moist or damp, as when imported, and offered for sale, are of a pretty dark reddish brown color, very like that of dark moist snuff. In drying both become of a lighter hue, and the African kind, on exposure to the air, soon exhibits a white efflorescence. Both when moist exhale a strong ammoniacal odor (the African the strongest), mixed with a different and peculiar smell, somewhat offensive, which, with the ammoniacal, they in a great measure lose in drying.

"Under the microscope, using a high power, both appear to consist chiefly of very minute granules, many of them smaller than the blood corpuscles, and of slender prismatic crystals of oxalate of ammonia, in which the African kind is most abundant.

"Subjected to chemical analysis, the two kinds (No. 1 the American, No. 2 the African,) have appeared to consist of—

	No. 1.	No. 2.
Matter soluble in water, destructible by fire, or volatile, such as oxalate of ammonia, diphosphate and muriate of ammonia, and animal matter.	41·2.....	40·2
Matter not destroyed by fire, nor soluble in water, or very slightly so, chiefly phosphate of lime and magnesia, with a little sulphate of lime, and a very little siliceous sand.	29·0.....	28·2
Matter not destroyed by fire, but soluble in water, chiefly common salt, with a little sulphate and sesquicarbonate of potash.	2·8.....	6·4
Matter destructible by fire, little soluble in water, chiefly lithate of ammonia.	19·0.....	—
Matter expelled in drying on a steam bath, chiefly water and sesquicarbonate of ammonia.	8·0.....	25·2
	<hr/> 100·0	<hr/> 100·0

"As regards the American Guano, the results of this coarse analysis do not disagree with those of the more minute one of Volckel, excepting in one particular; he obtained 7 per cent. of oxalate of lime, a salt which certainly did not exist in the specimen which I examined; and this I say after having carefully sought for it.

"Comparing the constituents as they are placed side by side of the American and African Guano, the chief difference seems to be, that while the American kind contains a large proportion of lithate or urate of ammonia, the African kind is totally destitute of it. This I little expected, considering its origin, the excrements of birds, their fæces and urine, the latter of which commonly consists chiefly of lithate of ammonia. The obvious explanation of the circumstance is, that the lithic acid, which formed a part of the urine, has in a long period of time suffered decomposition, and has given rise to oxalate of ammonia. And, that this Guano is very old, was indicated by the partially decomposed state of some feathers, not excepting the quills, which were included in it. I have said that the

African Guano is totally destitute of lithic acid ; and I believe I am warranted in coming to this conclusion, having carefully sought for it in vain. It may be mentioned that search also was made in both kinds of Guano for urea, but without well-marked success. The brown animal matter, soluble in water, yielded a small portion to alcohol, which had some of the properties of urea, and formed a compound with nitric acid, but less distinctly crystalline than the nitrate of urea.

“Before concluding, I would wish to say a few words relative to the tests of Guano,—the means of distinguishing between the genuine and the spurious kinds. Taking into account its origin, and that deposits of it can be found only where no rain falls, the inference seems now to be obvious either, if old, that it must abound in oxalate of ammonia ; or if comparatively of little age, in lithate of ammonia ; or if not of great age, it must contain a notable quantity of both these substances. These salts are easily detected, and the first mentioned, very readily by the microscope.

“The adulteration of the genuine kinds, to which the temptation is great, cannot be so easily detected. I fear it cannot be accomplished, excepting by means of chemical analysis, and that the farmer must hold himself dependent on the integrity of the merchant ; and if he would wish to avoid the chances of imposition, he must purchase only of the merchant of established name, and at the regular price.

“As Guano appears to be constantly exhaling ammonia on exposure to the atmosphere, to prevent loss and deterioration, it cannot be, before use, too carefully excluded from the air ; and on the same account, it ought not to be applied as a manure whilst vegetation is inactive, but rather at the moment of its coming into activity, and when in progress, according to the Peruvian manner of bestowing it on the plant, rather than on the soil.”

From “Hints to Farmers”—Longman & Co., London—p.18.

THE WIRE-WORM, SLUGS, &c., KILLED BY GUANO.

“SIR,—I understand you take a great interest in disseminating useful information amongst farmers, and as the new manure, Guano, is now getting into general use both in Ireland and England, I beg to state that I sold last year a considerable quantity for trials, in various quarters of the counties of Down, Armagh, Louth, Monaghan, Cavan, Kilkenny, Roscommon, &c. The results are generally highly favorable. Mr. Wm. Blacker, of Market Hill, used it to a great extent last year, and this season he is covering upwards of 1000 acres, which will take about 100 tons of Guano ; and at turnip time, from May to July, *ten times* the quantity will be required, as it preserves the crops, besides bringing them to maturity much earlier. There is a fact connected with potatoes this winter which should be generally known, viz., the bins of potatoes in the field grown with Guano manure were preserved through the winter ; but those potatoes grown with farm-yard manure partially decayed in the bins, but when brought into the barn kept well ; the crops from Guano were superior to the others, had a

finer skin, and much better in quality. The soil was sandy, and lies near the sea-shore. Several who used Guano for potatoes and turnips last year, sowed wheat in the autumn and this open spring, which looks remarkably well, without further manuring. If necessary, in May, a slight top-dressing with weak Guano in solution, one pound of Guano to eight gallons of water may be given.

"Guano, from its having the properties of nitrate of soda and other acids and salts, kills slugs, wire-worms, &c., in the ground, and acts as a preserver and protector of the growing crops in a variety of ways beneficially.

"I am, Sir, your obedient servant,

"BLAIN LEYLAND.

"*Newry, 20th March, 1843.*"

From Same, pp. 19, 20.

"*From Mr John Taylor, Surgeon, Liverpool, to Mr. W. Danson.*

"SIR,—Having noticed the progress of Guano, from its numerous analytical examinations through all its phases of practical application to agriculture, it has afforded me considerable satisfaction to perceive how well its theoretical character has been sustained by the *results* of experience. In the comparative trials which it has undergone with farm-yard manure, ammoniacal salts, nitrate of soda, &c., it has proved a concentrated animal manure of the richest fertilizing properties, capable of producing larger crops at less cost than any other, taking into account its slow solubility in the soil, which gives it permanence beyond its rivals. The discovery of the best means of applying it, so as to render the greatest amount of service, has obviated any objection against its use, and manifested its superiority when appropriately combined with sulphate salts, or decayed vegetable and carbonaceous matters, with due reference to the description of produce expected. The latest analysis of the genuine Guano by Dr. Ure, shows an entire absence of sand and other impurities which have been discovered in a large proportion in other specimens, and describes it as a compact mass of the salts of ammonia in combination with soluble phosphates, than which nothing can be conceived more nutritious for the support of vegetation. The genuine Guano, therefore, when mixed with an appropriate compost, excels farm-yard manure by the less amount of labor expended in its use; it excels bones, by possessing their nutritive phosphates in conjunction with much urate of ammonia; it excels the various refuse compounds of ammoniacal salts by possessing the phosphoric salts in addition to abundance of ammonia; and the possession of these salts likewise gives it a preference over nitrate of soda, which, like the ammoniacal salts, merely stimulates the growth of plants at the expense of the phosphates contained in the soil.

"I am, Sir, your most obedient servant,

"JOHN TAYLOR.

"*17 Nile Street, Liverpool, January 31, 1843.*"

From Mr. Skirving, Walton Nursery, Liverpool.

"GUANO.—I am happy to hear that this new manure, which was tried in our neighborhood last year for the first time, with such favorable results, has again proved itself to be one of the most valuable manures ever introduced. It has been used to a considerable extent in this county, both in a dry and liquid state; and in every instance, when properly applied, has answered well for crops of every kind. It has also been proved to be a lasting manure, for very good crops have been obtained without any manure whatever, from land where Guano was applied and yielded good crops last year. I have applied Guano on wheat and other grain crops, and on grass lands as a top-dressing, at the rate of 2 cwt. per statute acre, with most excellent effect. For turnips, I have used 4 cwt. to the acre, and had very good crops; and from 4 to 6 cwt. to potatoes, with like success. In the gardens and nursery grounds I have used it in a liquid state, and in that manner it has surpassed every manure yet discovered. Its effects on young fruit and forest trees are wonderful; also upon hot-house and green-house plants of every description; even the exotic heaths, to which manure of every kind has been considered injurious, seem to flourish in a manner beyond precedent when watered with it."

Remarks by Dr. Ure on an artificial or spurious Guano offered for sale in England.

"ANALYSIS BY DR. URE.

"This substance possesses none of the characters or properties of genuine Peruvian Guano, except a faint smell of it derived from an admixture of about 10 or 12 per cent. of Guano, and it is of little or no value to the farmer, as the following statement will show:—

One hundred parts of this spurious composition consist of }	
common salt or muriate of soda	32
Common siliceous sand	28
Sulphate of iron or copperas	5.2
Phosphate of lime (from Guano)	4
Animal and vegetable matter from Guano, &c.	23.3
Moisture	7.5
	<hr/> 100

"Genuine Guano, when burned upon a red hot shovel, leaves a white ash of phosphate of lime and magnesia, whereas the foreign substance leaves a black fused mass of sea-salt, copperas, and sand.

"The specific gravity of good fresh Guano is never more than 1.65, water being 100, whereas that of this substance is so high as 2.17, as produced by the sand, salt, and copperas in it.

"(Signed) : ANDREW URE, M. D., F. R. S.,
"Professor of Chemistry and Analytical Chemist."

From a Pamphlet on Peruvian and Bolivian Guano; its Nature, Properties; and Results. London: JAMES RIDGWAY. 1844.

*“General Report of the Chemical Examination of several Samples of Guano, belonging to Messrs. Antony Gibbs & Sons and Messrs. W. J. Myers and Co.—*In these various analyses, performed with the utmost care, and with the aid of the most complete apparatus for both inorganic and organic chemical research, attention has been directed not only to the constituents of the Guanos which act as an immediate manure, but to those which are admitted by practical farmers to impart durable fertility to the ground. The admirable researches of Professor Liebig have demonstrated that azote, the indispensable element of the nutrition of plants, and especially of wheat and others abounding in gluten, must be presented to them in the state of ammonia; yet not altogether in the pure or saline form, for as such it is too readily evaporated or washed away, but, in the dormant, or as one may say, the *potential* conditions, in contradistinction from the *actual*. Genuine Peruvian and Bolivian Guano, like that which I have minutely analyzed for Messrs. Antony Gibbs and Sons, of London, and Messrs. W. J. Myers and Co., of Liverpool, the two authorized agents for its sale, surpasses very far all other kinds of manure, whether natural or artificial, in the quantity of *potential* ammonia which it contains, and therefore in the permanency of its action upon the roots of plants: while in consequence of its ample store of ready-formed ammonia, it can give immediate vigor to vegetation.

“Urate of ammonia constitutes a considerable portion of the azotized organic matter of well-preserved Guano; it is nearly insoluble in water, is not volatile, and is capable of yielding to the soil, by its slow decomposition, nearly one-third of its weight of ammonia. No other manure can rival this animal saline compound. One of the said samples of Guano afforded, on analysis, no less than 17 per cent. of *potential* ammonia besides $4\frac{1}{2}$ per cent. of the *actual* or ready-formed; other samples from 7 to 8 per cent. of ammonia in each of these respective states.

“The genuine Guanos of which I have just spoken, are the mere excrement of birds, and are free from the sand, earth, or clay, and common salt, reported in the analysis of some Guanos. Indeed I myself have found 30 per cent. of sand, with almost no ammonia, in an effete Guano imported into England. The Peruvian and Bolivian Guanos contain, moreover, from 20 to 30 per cent. of phosphate of lime, the same substance as bone-dust; but elaborated by the birds into pulpy consistency, which, while it continues insoluble in water, becomes more readily absorbable by the roots of plants, and digestible, so to speak, in their organs.

“I feel, therefore, well warranted to affirm, that by the judicious application of these genuine Guanos, mixed with twice or thrice their weight of marly or *mild* calcareous earth, to convert the soluble phosphate of ammonia into bone-earth, especially when they contain much ready-formed ammonia, such crops will be produced, even upon sterile lands, as the farmer never raised upon the most improved soil by ordinary manure. To the West India planter, the Guano will prove the greatest boon, since it con-

denses, in a portable and inoffensive shape, the means of restoring fertility to his exhausted cane-fields; just as it has long enriched the poor table-lands of Peru.

"Reserving for the present the more particular analyses, the following may be offered as the average result of those I have made of genuine Guano in reference to its agricultural value:—

Azotized or organic matter, including urate of ammonia, and capable of affording from 8 to 17 per cent. of ammonia, by slow decomposition in the soil,	-	-	-	-	-	50.
Water,	-	-	-	-	-	11.0
Phosphate of lime,	-	-	-	-	-	25.
Ammonia, phosphate of magnesia, phosphate of ammonia and oxalate of ammonia, containing from 4 to 9 per cent. of ammonia,	-	-	-	-	-	13.0
Siliceous matter from the crops of the birds,	-	-	-	-	-	1.0
						100.0

"ANDREW URE, M.D., F.R.S., &c.

"*Professor of Chemistry and Analytical Chemist.*

"London, 13 Charlotte Street, Bedford Square,
13th Feb., 1843."

"The following is a detailed statement of experiments made by Thomas Stiles, Esq., a respectable and intelligent surgeon and landowner, farming part of his own land in the immediate vicinity of Spalding.

"Dale's Hybrid Turnips, sown on the 27th June, 1842, on ridges 27 inches apart. The soil a rich loam, with a sandy subsoil.

		Expense per acre.	Produce. Tons. Cwt.	
No farm-yard manure.]	No. 1.—6 cwt. of urate mixed with ashes.....	36s.	15	10
	No. 2.—6 cwt. of urate, 6 bushels of bones and ashes	54s.	17	10
	No. 3.—1½ cwt. of <i>guano</i> , 4 bushels of bones and ashes.....	42s.	21	4
	No. 4.—12 2-horse cart-loads of rich farm-yard manure.....	36s.	19	8
Ten load of rich farm-yard manure, ploughed into the ridges, at 3s. per load.	No. 5.—6 cwt. of urate, with ashes, 10 loads of well-made farm-yard manure.....	66s.	20	0
	No. 6.—6 cwt. of urate, 6 bushels of bones and ashes, 10 loads of the same manure	84s.	21	2
	No. 7.—12 bushels of bones, 3 cwt. of urate, ashes, 10 loads of manure.....	84s.	20	15
	No. 8.—1½ cwt. of <i>guano</i> , 4 bushels of bones, ashes, 10 loads of manure.....	72s.	22	0
	No. 9.—12 bushels of bones, ashes, and 10 loads of manure	66s.	20	0
	No. 10.—2 cwt. of <i>guano</i> and ashes, 10 loads of manure.....	70s.	20	0

"REMARKS.—Guano and bones are now considerably reduced in price, so that compost used in experiments No. 3 and 8 may be obtained for about 35s. per acre. I should certainly prefer them to any of the others. By their combination we obtain a fertilizer of extreme potency; recent chemical analysis shows us that they contain those elements which plants require as food.

"The following table shows the result of an experiment alluded to in a former report, in growing Swedish turnips with four different kinds of manure, which was this season made by Mr. Grieve, the intelligent land-steward of Mrs. Ferguson of Dirleton, and on whose perfect accuracy every confidence may be placed. The turnips were sown on the 20th of May, and lifted and weighed on the 27th November last. The field on which they were grown had, until lately, been time immemorial in grass, the soil being a dry friable loam. The value of the different manures speaks for itself; but it should be noticed that where the Guano was used the turnips seemed to braird more rapidly, were earlier ready for the hoe, and kept ahead of the others to the end, as if they had been sown at least a fortnight sooner.

Kinds and Quantities of Manures used per acre.	Price of Manure per acre.		Weight of Turnips without roots or tops.			Weight of roots and tops.			Weight of rotten Turnips.			Weight of Total Produce per acre.		
	£	s.	T.	C.	lb.	T.	C.	lb.	T.	C.	lb.	T.	C.	lb.
Guano, 5 cwt.	2	15	29	17	13	6	12½	11	1	13	17	38	2¼	13
Farm dung, 12 carts	3	12	25	7	8	6	15	6	2	12	13	34	14	27
Bones, 26½ bushels..	3	3	25	12½	12	5	1½	14	0	14	22	31	8½	8
Rape dust, 12 cwt..	3	0	22	19½	22	5	9	0	2	8½	6	30	17¼	0

"*Scotsman*."

"Results taken from 'Suggestions and Experiments in Practical Agriculture, by James F. W. Johnson, M.A., F.R.S., L. & E.' &c. The first table in the following page, as also two of those following it, refer to experiments on the farm at Barrochan, near Paisley, under the superintendence of Mr. Fleming. It may here be noticed, that in a communication recently addressed to Mr. Collingham, by the Hon. A. L. Melville, of Branston Hall, near Lincoln, allusion is thus briefly made to some more recent experiments. 'I hear from my brother that Mr. Fleming, of Barrochan, Renfrewshire, has this year, for the third year, found the most beneficial effects from the use of Guano. He has published the result of some former experiments (on Swede turnips), and his account of them may be thoroughly relied on.—November 16, 1843.'

"The following tables were calculated for Guano at the price of 25s. per cwt.; but the cost of this manure may now be estimated at less than one-half—the imported price of the best Guano being from 10s. to 12s. per cwt.*

* It will at once be seen that in the estimate of the comparative cost of the manures used, that of Guano at present prices, say about £10, or \$50 per ton, should be reduced more than one-half from the sums here stated.

No.	ORCHARD FIELD. Description of Manures used.	Quantity applied per imperial acre.	Produce of Bulbs topped and tailed, per $\frac{1}{8}$ in. acre.	Produce of Bulbs, topped and tailed, per imperial acre.	Cost of Manure per imperial acre, including carriage and putting on.		
					£	s.	d.
1	Peat and Night-soil mixed,	20 tons.	4800	17 2 3	6	12	0
2	Gypsum,	5 cwt.	4080	14 11 2	0	12	6
	Carbonate of Lime,	20 bush.	4640	16 11 2	0	3	0
3	{ Sulphate of Ammonia, ..	1 cwt. }	4320	15 8 2	1	12	0
	{ Quick-lime,	20 bus. }					
	{ Soot,	20 bus. }					
4	Sulphur,	6 lbs.	3980	14 13 1	0	2	0
5	Imitation of Daniel's } mixture,	50 bush.	4400	15 14 1	0	15	0
6	Wood Charcoal Powder, ..	50 bush.	4240	15 2 3	2	10	0
7	Fresh Animal Charcoal, ..	10 cwt.	5920	21 2 3	2	10	0
8	Exhausted Animal Char ^l , ..	10 cwt.	5560	19 17 1	2	0	0
9	Turnbull's Humus,	50 bush.	4800	17 2 3	2	10	0
10	Bones dissolved in Muriatic Acid,	10 cwts.	5200	18 11 3	3	00	0
11	Barrochan Artificial Guano,	3 cwts.	4960	17 14 1	1	10	0
12	Turnbull's do. do...	3 cwts.	4880	14 11 2	1	4	0
13	NATURAL GUANO,	3 cwts.	6560	23 8 2	3	15	0
14	Salt and Quick-lime mixed } 3 months old,	50 bush.	4240	15 2 13	0	15	9
15	Soot,	50 bush.	4480	16 00 00	1	0	0
16	Potash and Lime mixed, } 14 months old,	50 bush.	4400	15 14 1	1	17	6
17	Quick lime,	50 bush.	3200	11 8 2	0	9	9
18	Wood ashes,	50 bush.	3600	12 17 1	1	15	0
19	Bone dust,	40 bush.	4160	14 17 1	5	10	10
20	Rape-dust,	1 ton.	4000	14 5 3	8	10	0
21	Woollen Rags,	1 ton.	3920	14 0 0	9	9	0
22	Farm-yard Dung,	20 tons,	5200	18 11 2	10	10	0
23	Nothing, .....	.....	3440	12 5 3	.....	.....	.....

REMARKS.—The land is a light loam, loose in texture, and of a light brown color, subsoil hard, and full of small stones; it is of as nearly as possible the same quality. The turnip seed was all sown upon the same day. Rain came on the night after sowing, and in consequence the crops braided well, and came away strong. Those which show the greatest weight in the table, kept the lead of the others all the season. The numbers of the plots in the table are placed in the order in which they followed each other on the ground. The crop would probably have been larger had there been more rain.

Among the other experiments upon turnips here stated, those upon Guano are the most practically successful. Thus, without any farm-yard manure—

Per Acre.	Tons.	Cwt.	Per Acre.
3 cwt. of Guano alone gave	23	8	of Swedes.
5 cwt. Guano with	32	2	of Early Yellow.
20 bushels of wood ashes,			
5 cwt. Guano alone - - -	32	15	of White Globes.
3½ cwt. ditto - - -	20	0	of Yellow and White mixed.
3¼ cwt. ditto - - -	28	0	of Purple-topped Yellow.

EXPERIMENTS UPON POTATOES.—*Comparative Experiments with various substances used as manures for growing Potatoes, planted 18th May, and lifted 12th October, 1842. The quantity of land in each plot was one sixteenth of an imperial acre.*

No.	Description of Manures used, and kinds of Potatoes.	Quantity of Manure applied per imperial acre.	Produce in Bolls (of 5 cwt. each) Renfrewshire measure, per imperial acre.	Produce in Tons, &c., per imperial acre.	Cost of Manure per acre, including cartage and putting on.
BARROCHAN.					
A.—White Don Potato.					
1	{ Turnbull's Humus, Wood-ashes, mixed, Rape-dust, Turnbull's prepared Bones, Turnbull's artificial Guano, Natural Guano,	30 bushels, 30 bushels, 1 ton, 3 cwt., 3 cwt., 3 cwt.,	45 11 15 49 5 33 34 14 2 43 10 15 73 13	11 8 2 12 6 2 13 14 1 10 15 0 18 0 1 4 0 3 17 0	2 7 0 8 12 0 0 18 0 0 1 4 0 3 17 0
B.—Red Don Potato.					
6	Soil, simple,	50 bushels,	27	6 15 0	1 5 0
7	Wood-ashes,	4 cwt.,	30 2	7 10 2	5 0 0
8	Natural Guano,	4 cwt.,	57 6	14 6 5	5 0 0
9	Natural Guano, and Wood-ashes,	4 cwt., and 25 bushels ashes,	63	15 15 0	5 12 6
10	Natural Guano, Wood-ashes, and Wood-Charcoal,	4 cwt., and 20 bushels charcoal,	70	17 10 0	6 0 0
11	Turnbull's artificial Guano,	4 cwt.,	51	12 15 0	1 12 0
12	Turnbull's artificial Guano, and Wood-ashes,	4 cwt., and 25 bushels ashes,	51	12 15 0	2 4 6
13	Turnbull's prepared Bones, and Wood-ashes,	4 cwt., and 25 bushels ashes,	54 14 2	13 14 1	1 16 6
14	Turnbull's prepared Bones,	4 cwt.,	51	12 15 0	1 4 0
15	Rape-dust.	1 ton,	40	10 0 0	8 12 0
16	Rape-dust and Wood ashes,	1 ton, and 25 bushels ashes,	56	14 0 0	9 4 6
17	Potash and Lime (1 lb. Potash to 1 bushel Lime),	60 bushels,	39	9 15 0	2 2 0
18	Gypsum.	5 cwt.,	39	9 15 0	0 12 6
19	Salt and Quick-lime (4 cwt. Salt to 1½ tons Lime),	60 bushels,	34	8 10 0	1 0 0
20	Humus and Wood-ashes,	40 bushels, and 25 bushels ashes,	36	9 0 0	2 14 0
21	Bone-dust,	45 bushels,	39	9 15 0	6 14 0
C.—Connaught Caps Potatoe.					
22	Soil, Simple,	45 bushels,	23	5 15 0	6 14 0
23	Bone-dust,	4 cwt.,	39	9 15 0	5 1 6
24	Natural Guano,	1 ton,	54 14 2	13 14 1	8 12 0
25	Rape-dust,	50 bushels,	52	10 15 0	2 12 0
26	Turnbull's Humus,		43		

The above manures were put in with the potatoe cutting,—no top-dressing being afterwards applied.

EXPERIMENTS UPON BARLEY.—*Results of Experiments with various substances used as top-dressing upon Barley (common white). The Barley sown 14th April, top-dressed 6th May, and cut down 25th August, threshed, cleaned, measured, and weighed 5th October, 1842. The quantity of land in each plot was one-eighth of an imperial acre.*

No.	RODEN HILL FIELD, BARROCHAN,		Quantity of Dressing applied.	Weight in imperi- al pounds when cut in sheaf.	Amount of grain in imperial pounds when threshed and cleaned.	Weight of straw when threshed, in imperial pounds.	Weight per bush- el of grain fit for market.	Cost of Dressings.	Quantity of grain fit for market per imperial acre.
	Description of Top-Dressing.								
1	{ Nitrate of Soda,	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	s. d.	bush. lbs.
2	{ Common Salt,	10 1	1621	364	500	56	{ 2 0 }	{ 0 2 1 }	52 0
3	{ Sulphate of Soda,	14 1	1638	378	491	55	{ 1 6 }	{ 0 5 1 }	54 54
4	{ Sulphate of Magnesia,	21 1	2192	432	589	54	{ 9 7 }	{ 3 6 }	64 0
5	{ Natural Guano, at 25s.,	42	1665	255	590	54	{ 0 5 1 }	{ 3 6 }	37 42
6	{ Nitrate of Potash,	14	1735	378	495	57	{ 3 6 }	{ 0 5 1 }	53 0
7	{ Common Salt,	42	1620	325	425	55	{ 3 0 }	{ 0 5 1 }	47 15
	{ Nothing,	—	1620	325	425	55	{ 3 0 }	{ 0 5 1 }	47 15
	{ Turnbull's artificial Guano,	42	1625	334	480	54	{ 3 0 }	{ 0 5 1 }	49 26

REMARKS.—The soil of this field is a light loam, as nearly as possible uniform in quality, and had lain about ten years in pasture previous to the spring of 1842, when it was all trenched with the spade twelve inches deep. It had been thorough-drained with tiles some years before breaking up. After being trenched, it was dressed over, except where the experiments were, with two chaldrons of lime per acre, slacked with water in which common salt had been dissolved, and before sowing the barley, with the exception of the experiment ground, it was top-dressed over with two and a half cwts. of Turnbull's artificial Guano per acre, harrowed in, as was also the top-dressing No. 3 in the table of experiments. The barley was sown broad-cast, two and a half bushels per acre. Owing to the extraordinary drought at the time of sowing, it did not braird well till the rain came; after which it made rapid progress. Advantage was taken of heavy rains to put on the top-dressings, all of which were sown at the time above stated, viz., 6th May, except No. 4, which was not sown till the 17th, at which time there was little rain, and in consequence, it burned the plants, from which they did not recover all the season, and the ground got full of weeds. No. 5 burned the plants also, but they recovered quickly, and gave a good return. As was remarked before, wherever common salt was put on as a top-dressing on grain crops, either of wheat, barley, or oats, and on whatever description of soil upon this estate, the grain was invariably heavier per bushel, and had fewer weeds or tails in proportion to the quantity of grain per acre, than any of the other dressings applied here. From the frequent mention of spade-culture in these experiments, many may consider that they were upon a very small scale, which is not the case, the greater proportion of them being very extensive, Mr. Fleming, to give employment to the destitute laborers, having dug and trenched about thirty acres of land instead of ploughing it, which accounts for the frequent mention of spade-culture, which, when it can be executed at a moderate rate (particularly trenching at £4 per acre), is very advantageous, and seems superior to trench-ploughing.

A. F. GARDNER.

REMARKS ON THE THREE PRECEDING EXPERIMENTS.

“ON THE TURNIP EXPERIMENT, Page 53.

“In these experiments, a striking contrast is presented between the effects of rape-dust and those of Guano. 16 cwt. per acre of the former gave only $3\frac{1}{2}$ tons of turnip bulbs, while 2 cwt. per acre of the latter gave 5 tons. It appears, therefore, that *rape-dust requires moist weather or occasional rains, while Guano, even in very dry seasons, will produce a considerable effect.*

“These results are very gratifying, since they seem to show that for the turnip crop this light and portable manure may be substituted with safety for farm-yard dung. But they are more gratifying in connection with the large reduction which has lately taken place in the price of this substance. In none of the cases above mentioned did the quantity applied exceed five cwt. per acre. This quantity may now be purchased for three guineas, though, when these experiments were undertaken, it cost 6*l.* 5*s.*

“ON THE BARLEY EXPERIMENT, Page 55.

“THE true practical value of the experiments upon barley will be shown by placing them in the following form:—

	Increase.	£	s.	d.	Cost per bush.
Nitrate of soda with common salt gave	5 bush. for	0	17	6	— 3 <i>s.</i> 8 <i>d.</i>
Sulphate of soda with sulphate of } magnesia	7 bush. for	0	15	6	— 2 <i>s.</i> 1 <i>d.</i>
Guano (at 12 <i>s.</i> 6 <i>d.</i>)	17 bush. for	1	19	0	— 2 <i>s.</i> 3 <i>d.</i>
Common Salt.	6 bush. for	0	4	6	— 0 <i>s.</i> 9 <i>d.</i>
Turnbull's artificial Guano	2 bush. for	1	4	0	— 12 <i>s.</i> 6 <i>d.</i>

“The cheapest application, without doubt, upon this soil, is common salt. Guano would produce the barley at 2*s.* 3*d.* per bushel, and the larger quantity reaped, together with the value of the straw in the preparation of manure, may satisfy many that either Guano or the mixture of sulphates may be used with profit.”

"ON THE POTATO EXPERIMENT, Page 54.

"NEARLY all the experiments in the first table of results were made with mixed manures.

"*Guano and Rape-dust.*—Among these the effect of Guano is again striking, and upon two of the varieties greatly exceeds that of rape-dust. Thus the produce of the three varieties tried was

	Unaided Soil.		With 3 cwt. Guano.		With 4 cwt. Guano.		With 1 ton of rape-dust.	
	Tons.	Cwt.	Tons.	Cwt.	Tons.	Cwt.	Tons.	Cwt.
White Don	?	?	18	9	.....	.....	12	6
Red Don	6	15	.....	.....	14	6	10	0
Connaught Cups	5	15	.....	.....	13	14	13	0

"SIR,

"The following comparative experiment of five different manures applied to a potato crop this last season, may not be uninteresting to some of my fraternity. In order to give a proper knowledge of the circumstances, I will require to premise that the soil is a deep rich loam, but in such a droughty situation that the crop was much injured in consequence of the very dry season, which caused a comparative deficiency of produce. It must also be kept in view that the drought would operate in a greater degree upon the crop where the farm-yard manure was applied than on the others, it being considered inadvisable to apply that manure in the drills to potatoes in dry situations. With these remarks I beg to subjoin the comparative statement :—

	Cost.	Produce.	
Guano and Gypsum mixed, $1\frac{1}{2}$ cwt. each	24s.	19	11-16ths Bolls.
Rape-dust, 5 cwt.	30s.	16	10-16ths do
Pollards, or fine bran, 5 cwt.	30s.	16	11-16ths do
Farm-yard Manure, 8 carts, at 4s.	42s.	14	11-16ths do
Nitrate of Soda, $1\frac{1}{2}$ cwt.	34s.	12	14-16ths do

Each lot contained half an imperial acre.

"(Signed)

THOMAS HUME, jun.

"To Messrs. S. Banks and Son."

THE FOLLOWING EXPERIMENT WAS MADE IN THE PARISH OF WRAXALL, IN THE COUNTY OF SOMERSET, IN 1842,
ON SWEDES, WITH GUANO SUPPLIED BY GIBBS, BRIGHT & CO., OF BRISTOL.

Nature of Soil	Preceding Crop.	Character and Quality of Manures per Acre.	Cost of Manures per Acre.	Time of Sowing.	How often sown, and what Quantity.	How often Hoed.	What Disease, if any.	When pulled.	Ground Sown.	Weight per Acre, after being topped and tailed.	Cost of Manure per ton of Net Produce.
Light loam on limestone. High and exposed situation.	Wheat.	Cwts. qrs. lbs. 2 0 23 Guano. 2 0 23 Mould. 1 0 11 Charcoal	Guano, at } £ s. d. 14s. per } 1 10 10 Cwt.— } Charcoal } Pounding } 0 5 0 &c. } £1 15 10	Drilled in, the 18th May	Once, 2½ lbs. per acre.	Hoed three times, and hand weeded twice.	Slight mildew, first observed early in August.	From the 10th to 16th Nov.	A. R. P. 0 3 25	tons.cwts.qrs.lbs. 17 4 0 20	2s. 1d.
Ditto.	Ditto.	20 tons, stable-yard Dung.	Dung, at 5s. per ton, £5.	Ditto, 18th May	Once, 2½ lbs. per acre.	Ditto.	Ditto.	Ditto.	A. R. P. 0 3 20	tons.cwts.qrs.lbs 16 18 1 1	5s. 11d.
Ditto.	Oats.	32 bushels Bones.	Bones, at 23s. per quarter, £4 12s.	Ditto, 25th May	Once, 2½ lbs. per acre.	Ditto.	Ditto.	Ditto.	A. R. P. 0 0 30	tons.cwts.qrs.lbs. 15 17 2 9	5s. 9½d.

* Some of the rows deficient, and made up from plants on the Guano piece.

REMARKS.—Guano compost lain in rows, covered with the plough, and seed drilled in upon it.
(*Guano, its analysis and effects* : 1842.)

"The Liverpool United Brokers' Circular states, that 2000 tons of the new manure, called Guano, has been recently sold in this town at from 10*l.* to 12*l.* per ton. This quantity will raise 10,000 acres of turnips, as 4 cwt. per acre has been found sufficient for that purpose. With that quantity, which at the present price will only cost 2*l.*, we ourselves raised larger crops of turnips last year than we were able to raise with 8*l.* worth of common manure. If the original importers of this valuable manure had been satisfied to offer it to the public at the present price, the consumption would have been ten times as great as it is now; for having tried Guano with every description of crop, we do not hesitate to pronounce it the cheapest and most valuable manure ever introduced into this country. As we are buyers, not sellers of the article, our praise of it is at least disinterested.—*Liverpool Times*, February 20, 1843."

"*Peruvian and Bolivian Guano.—Wheat, Barley, Oats, &c.*

"WHEAT.

"The Stewponey Agricultural Society have published a new edition of their rules and regulations, included in which is the 'Essay on Manures,' by Mr. Daniel Banton, of Seisdon, a member of the society, which gained the prize at their last anniversary meeting. This essay contains the result of certain experiments tried with various manures in the cultivation of wheat.

"I have used Guano and nitrate of soda as manures for wheat and turnips rather extensively this year, the particulars of which, upon wheat, I shall give below, and have only to state here, with regard to turnips, that Guano promises to be an effective manure. I have applied it both for common turnips and Swedes, and it appears to answer well in both cases. Part of a field for Swedes had half a dressing in the winter with fold-yard manure, not of the best quality, and ploughed in immediately before being ridged up. I had sown on the surface scarcely 1 cwt. of Guano per acre; the other part of the field was dressed with butcher's manure. The Swedes are not early, but still growing fast, and promise to be a big crop. The part where the Guano was used, is quite as good as the other, and perfectly free from mildew. I applied 1 cwt. of Guano upon a plot of spring vetches, but could see no effect.

"The following manures were made trial of in a field of land (in tolerable good condition) situate at Seisdon, within the limits of the Stewponey Agricultural Society, in the county of Stafford. The soil a light sandy loam, commonly called "turnip and barley land," subsoil a gravelly sand, base on a red sandstone. This field has a gently sloping aspect to the north-west, a year-old clover root, flay ploughed, and drilled seven inches wide with white wheat, on the 19th of Oct., 1841, at the rate of 2½ bushels per acre, 38 quarts to the bushel. The plant of wheat was thick and strong through the winter, and at the time of applying the manures, was rather forward for the season. On the 23d of April six plots of land were accu-

rately measured with a chain, each containing one-eighth of an acre, and manured as under :—

No. 1, with Guano, at the rate of $1\frac{1}{2}$ cwt. per acre.

“ 2, Guano and nitrate of soda, equal proportions, $1\frac{1}{2}$ cwt. per acre together.

“ 3, nitrate of soda, $1\frac{1}{2}$ cwt. per acre.

“ 4, white caustic lime, at the rate of 4 tons per acre.

“ 5, lime and salt, in proportion of 5 cwt. of salt to 10 cwt. of lime per acre, mixed a week before being applied.

“ 6, had no manure.

“ ‘There was no rain for ten days after the manures were applied: the days being hot, and the nights generally frosty. Seven days after the first rain, a slight difference in color was visible in plots Nos. 1, 2, and 3, where the nitrate and Guano were applied; and on the 16th of May, a striking difference was seen in those plots to the rest of the field, the nitrate assuming the deepest, the nitrate and Guano the next shade, and the Guano the palest green of the three. There were no visible effects where lime alone, and lime and salt, were put. From May, till the wheat shot into the ear, which it did at the same time all over the field, the plots Nos. 1, 2, and 3, might be distinctly traced by the eye at a considerable distance.

“ ‘Mr. Banton then proceeds to notice that the red rust, which generally prevailed in the neighborhood, attacked the plots 1, 2, and 3, particularly that on which the nitrate of soda alone was spread. He considers that white wheat is more subject to rust than red; but though white wheat is yearly more or less attacked by it, the sample or yield is very rarely injured.

“ ‘The crop was cut by Welshmen, with hooks, on the 12th of August, and the produce of each plot kept by itself, and so threshed. The result of which was as under :—

Produce of Wheat, per Imp. bushel.			Straw.	Weight of Wheat per Imp. bushel.	Straw per Acre.	Wheat per Acre, the Imp. bushel.
No.	bush.	pks.	lbs.	lbs.	cwt. qr. lb.	bush.
1	5	$2\frac{1}{2}$	479	62	34 0 24	45
2	4	2	428	62	30 2 8	44
3	5	$0\frac{1}{2}$	436	62	30 2 16	41
4	5	$1\frac{1}{2}$	426	62	30 2 6	$42\frac{1}{2}$
5	4	$3\frac{1}{2}$	326	62	23 1 4	39
6	4	$3\frac{1}{2}$	326	$61\frac{1}{2}$	23 1 5	39

“ ‘I have not calculated the tail-corn, which was very trifling, not exceeding a quart from each lot. It appears that the lime and salt did not produce any effect, except half a pound per bushel in the weight. It perhaps will appear singular that each lot was the same weight per bushel in the first five, but such was the case. The nitrate and Guano were pro-

cured direct from the importer, and I believe were genuine. Nitrate 34s. 6d., and the Guano 20s. per cwt. The lime 12s, and salt 19s. per ton, exclusive of carriage.

SUMMARY.

Cost of Manure per Acre, including Carriage.	Increased value of Straw per Acre, at 2s. 6d. per cwt.			Increased value of Grain per Acre at 7s. per bushel, imp. meas.			Total in- crease in value of Crop per Acre.			Net Profit per Acre, after ded- ucting the expense of manure.			Loss per Acre, after deducting cost of manure.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Guano,	1	7	6	1	7	0	2	2	0	3	9	0	2	1	6
Nitrate and Guano, 1	10	3		0	18	2	1	15	0	2	13	2	1	2	11
Nitrate of Soda alone,	1	13	0	0	18	4	0	14	0	1	12	4	..	0	0
Lime,	3	8	0	0	18	2	1	11	6	2	2	8	..	1	5
Lime and Salt, . .	0	14	0	None.			None.			..			..	0	14

“The summary of the results of this clever farmer’s experience is, that Guano produced the greatest increase in the crop, both of straw and grain, at the smallest cost. We observe he complains that the cost of lime and nitrate of soda, and indeed of most other manures, is disproportionately high : 20s. a cwt. he appears to have paid for the Guano employed in the above experiment. It is now to be had at 12s. a cwt., and may be purchased even lower when a large quantity is taken. Estimating, therefore, Guano at 12s. a cwt., the result would be (we make the same allowance for carriage as Mr. Banton, which, we presume, includes the cost of putting it on the land), that 17s. of Guano per acre gives six bushels, or two bags an acre, more than the average of No. 6, which had no manure ; and eleven tons more straw, or a net profit, after deducting the cost of manure, of 2l. 9s. per acre ; the reduction which has taken place in the cost of Guano making a difference of 10s. an acre in the cost of applying it. We think it right to state these facts for the information of our agricultural readers.” —*Guano, its Analysis and Effects*, 1842.

“BARLEY.

“From the numerous experiments which have been made with different manures in different parts of the kingdom, on almost every variety of soil and situation, it is reasonable to hope, that by a comparison of the results obtained by these means, we may arrive at something near the truth, and be enabled to form an estimate of the relative value of the substances that may have been made the subject of investigation. It is with the view of assisting in this important work, that I have received the permission of Sir Charles Lemon, Bart., M. P., to transmit you the following details of some experiments made at Carclew, in 1843, for the purpose of testing, on a small scale, the merits of certain manures, when applied as a top-dressing

to growing crops; and although they are far too limited in extent for us to draw any positive conclusions from them as to the real value or inefficiency of either of the substances employed, they will probably be useful in some degree, as exhibiting their fertilizing powers under circumstances precisely similar in every respect.

"The subjects selected for this experiment were, 1, nitrate of soda; 2, sulphate of soda; 3, Guano; 4, sulphate of ammonia; 5, Stott's soluble manure; and, 6, drainings from the farm-yard. The field considered as the most suitable for giving the whole a fair trial, was one with a high open exposure sloping to the south, where the soil is a freelight loam, averaging about a foot in depth, on a yellow clayey subsoil, interspersed with spar. It had been well manured the previous season, and cropped with turnips. After these were removed, the ground was ploughed and prepared for barley, which was sown in the latter part of April. On the 15th May the manures were applied, the tenth part of an acre being allotted for each experiment. [After some remarks on the other manures, Mr. Booth proceeds thus :—]

"*Guano*.—The conflicting statements which have appeared from time to time respecting the proper quantity which ought to be applied of this manure, and the failures that have occurred from using it too bountifully, induced me to use a much smaller proportion of it than is now recommended, but, notwithstanding this, its effects were truly remarkable; for, although only 16½ lbs. were sown dry over this allotment, which is at the rate of about 1½ cwt. per acre, it could readily be distinguished during the growing season from any other part of the field. The corn tillered well, and appeared thicker than in Nos. 1 & 2, and although somewhat shorter, it was in other respects equally strong and healthy, and of a rich deep green. It deserves to be noticed that, at the time of binding up the corn, the workmen remarked what appeared to them to be a difference in the weight of the sheaves, compared with those in the first and second plots, which they had previously bound up, and the result showed an increase over the nitrate of soda, of no less than 81 lbs. of straw, and 74 lbs. of corn; the weight of the straw being 280 lbs., of corn, 252 lbs.; equal to 5 lbs., or 50 bushels per acre. Besides this experiment, I have made several others with Guano in a liquid state, on vegetables in the kitchen garden, all of which have satisfied me that this manure, when unadulterated, is one of the most powerful that can possibly be employed for gardening purposes. Its effects are visible in the course of eight or ten days after its application. For onions, celery, and the cabbage tribe, it surpasses anything of the kind I ever witnessed. I had portions of each of those vegetables watered with Guano, without being made aware of the particular spots so treated, and at the end of a week I had no difficulty in pointing out every one of them where the Guano had been used.

"The subjoined table will more readily show the results of the several experiments :—

TABLE

Showing the result of Experiments with different Manures applied as a top-dressing to Barley, 1843.

KIND OF MANURE.	Quantity used on one-tenth of an Acre.	Price.	Produce of one-tenth of an Acre.			Cost per Acre.	Rate of Produce per Acre.	
			Straw.	Corn.	Bushels.		Straw.	Corn.
	lbs.	s. d.	lbs.	lbs.		l. s. d.	cwt. qr. lb.	bsh.
Nothing			233	200	4		20 3 6	40
1. Nitrate of Soda .	33 $\frac{1}{2}$	6 0	199	178	3 $\frac{3}{4}$	3 0 0	17 3 2	37
2. Sulphate of Soda	33 $\frac{1}{2}$	3 0	264	215	4 $\frac{3}{4}$	1 10 0	23 2 8	43 $\frac{1}{2}$
3. Guano	16 $\frac{1}{2}$	2 0	280	252	5	1 0 0	25 0 0	50
4. Sulphate of Ammonia }	12	3 11	269	232	4 $\frac{3}{4}$	1 19 2	24 0 2	47 $\frac{1}{2}$
5. Scott's Soluble Manure }	22 $\frac{1}{2}$	4 0	288	257	5 $\frac{3}{8}$	2 0 0	25 2 24	53 $\frac{1}{2}$
6. Drainings of farm-yards }	glls. 100		300	256	5 $\frac{1}{4}$		26 3 4	52

W. B. Booth, Carclew, 25th November, 1843.

WHEAT.—The following Experiment was made in the Parish of Wraxall in the County of Somerset, with Guano supplied by Gibbs, Bright & Co., of Bristol.

Nature of Soil.	Preceding Crop.	Character and quality of Manures, and quantity per Acre.	Cost of Manures per Acre.	Time of Sowing.	Ground Sown.	PRODUCE.		Remarks.
						Bushels Wheat per Acre.	Straw per Acre, weighing 84 lbs. per doz. Sheaves.	
No. 1. Poor land, light loam, stony, upon lime-stone rock. High and exposed situation.	Potatoes.	Guano. Cwts. qrs. lbs. 2 2 20	At 14s. per Cwt. £1 17 6	February.	A. R. P. 0 1 20	34½ Bushels.	32 Dozen.	Guano sown after the seed was drilled in, and harrowed at once, Nos. 1, 2, and 3. Well manured with dung for the potato crop. The land was in good heart, and tolerably clean, though naturally poor.
No. 2. Ditto.	Ditto.	Stable Dung, 12 Tons.	5s. per Ton. £3 0 0	Ditto.	0 2 0	34 Ditto.	26 Ditto.	
No. 3. Ditto.	Ditto.	Bones, 20 Bushels.	At 23s. per Quarter. £2 17 6	Ditto.	0 1 20	28½ Ditto.	23 Dozen and 3 Sheaves.	
No. 4. Ditto.	Summer Fallow.			Ditto.	0 3 12	20½ Ditto.	16 Dozen and 4 Sheaves.	No. 4. Very clean.

N. B.—All the land was prepared for wheat-sowing in the fall, but the season would not admit of the seed being put in till February.

(See *Guano, its Analysis and Effects*: 1843.)

EXPERIMENTS UPON WINTER WHEAT, made to ascertain the relative effect of certain Mixed, chiefly Saline, Manures, applied as Top-dressings to Winter Wheat.—Results of Experiments with various Substances, used as Top-Dressings upon a Winter Wheat. Dressed 9th May, and cut 7th September, 1842. The quantity of land in each plot was one-sixteenth of an imperial acre.

No.	CROOK'S FARM, BARROCHAN. Description of Top-Dressings.	Quantity of Dressing applied.	Weight in imperial pounds when cut in sheaf.	Weight of Grain in imp. pounds when threshed and cleaned.	Weight of straw when threshed in pounds.	Weight of clear grain per bushel.	Cost of Dressings.	Quantity of clean grain per imperial acre.	Weight of threshed straw per imperial acre.
		lbs.	lbs.	lbs.	lbs.	lbs.	s. d.	bush.	lbs.
1	Nothing,	—	400	95	160	61	0 0	24	56
2	Natural Guano,	21	540	115	230	60	4 4½	39	40
3	Turnbull's Artificial Guano,	21	420	95	175	61	1 8	24	56
4	Common Salt,	21	360	80	50	62½	0 4	21	27
	{ Sulphate of Soda,	10½ }					{ 0 8 }		
	{ Nitrate of Soda,	5 }	480	101	190	61	{ 1 0 }	26	30
5	Common Salt,	21	460	90	170	63	{ 0 4 }	2	54
	{ Dissolved Bones,	7 }					{ 0 7 }		
	{ Rape-dust,	35 }					{ 2 7 }		
6	{ Sulphate of Magnesia,	5½ }	510	110	200	62	{ 0 6 }	28	24

REMARKS.—The soil is a heavy loam, incumbent upon a deep clay. The wheat was sown at the end of November, 1841, after a crop of yellow turnips. The turnips were manured with 20 tons of town-dung per acre. Owing to the severity of the winter of 1841 and spring of 1842, the plants were very thin upon the ground. In April, 1842, it was sown down with grass-seeds, harrowed and rolled, after which it tilled and gradually recovered. At the time the dressings were put on, there was rain, but in general it was dry weather after, and in consequence the top-dressings did not produce such great results as they did in 1841. The field was examined from time to time, and the appearance of each experiment as noted down is fully borne out by the results given in the table, viz.—No. 1 was taller in the straw, longer in the ear, and of a darker green color than any of the others; No. 6 was next, and No. 4 was third. In point of appearance there was in the others no perceptible difference from the general crop, except No. 3, which appeared to have checked the growth of the plants, and from this check they scarcely recovered all the season. It is, however, remarkable, that wherever common salt was applied, the grain was heavier per bushel. It will be observed, with reference to the experiment upon wheat grown on this land last year, that the application of common salt had a very great effect, and would probably have also benefited the general crop this year, had it not been for the extraordinary drought of the season.

EXPERIMENTS UPON OATS.—*The following Series of Experiments were made at Lennox-Love, at the request of Lord Blatyre, the general object being to ascertain the relative Effect of different Saline Substances applied as Top-Dressings upon young Oats:—*

Oats, second crop, after old lea. Soil, sharp loam; sub-soil clay, resting on sandstone-rock. Oats sown 14th March; top-dressings applied 13th May; crop cut 27th Aug.; and threshed 9th Sept., 1842. The quantity of land in each plot was one-eighth of an imperial acre.

No.	QUARRY FARM, LENNOX LOVE. Description of Dressing.	MANURES.		Weight of produce as carted from field.	Weight as taken from Threshing Mill of				Weight per bushel of Dressed Grain.	Quantity of Dressed Grain.	Increase of produce in Dressed Grain.	Decrease of produce in Dressed Grain.
		Quantity applied.	Cost thereof.		Dressed Grain.	Grey or Seconds.	Straw.	Chaff, &c., unweighed.				
		lbs.	s. d.	lbs.	lbs.	lbs.	lb s.	lbs.	lbs.	Bushels.	Eushels.	Bushels.
1	Nothing, . . . . .	....	....	672	264	8	362	38	39½	6.75	....	....
2	Common Salt,	14	0 4	588	239	13	323	13	40	6.00	....	.75
3	{ Rape-dust,	7	7 4	644	236	24	328	56	40	5.95	....	.80
4	{ Nitrate of Soda,	14	3 1	588	205	21	276	86	39½	5.19	....	1.56
5	{ Rape-dust,	7	8 7	616	231	17	266	72	40	5.56	....	1.19
6	{ Nitrate of Soda,	7	2 0	504	187	12½	266	38½	39	4.81	....	1.9
7	{ Sulphate of Soda,	7	1 0	504	188	11	249	66	39½	4.82	....	1.93
8	{ Sulphate of Soda,	7	7 5	672	263	20	355	34	40½	6.56	....	.19
9	{ Rape-dust,	112	14 0	616	224	26	324	42	40½	5.62	....	1.13
10	{ Rape-dust,	224	5 0	938	351	30	496	61	40½	8.75	2.00	....
11	{ GUANO,	28	4 0	532	193	11	269	59	37½	5.12	....	1.63
	{ Soot,	4 bush.	—	700	273	15	390	22	39½	7.00	.25	....
12	{ Waste water from gas- work, diluted with four times its bulk of water,	6 galls.	—	700	273	15	390	22	39½	7.00	.25	....

EXPERIMENTS BY ROBERT MONTEITH, ESQ., OF CARSTAIRS.

"I.—OAT CROP, 1843.—Part of a field manured with 267 lbs. of Guano, at the cost of 31s. per imperial acre, produced, per acre, 59 bushels.

"Manured with 10 bushels bone-dust, at the cost of 28s. 4d. per imperial acre, produced, per acre, 43 bushels.

"The difference may be stated as follows:—

Cost of Guano, 31s. 0d. ; produce 59 bushels, at 2s. 6d.,	£7	7	6
Cost of Bones, 23s. 4d. ; produce 43 bushels, at 2s. 6d.,	5	7	6

7s. 8d.					2	0	0
Deduct difference of manure,	-	-	-		0	7	8

Leaving in favor of Guano,	-	-	-	£1	12	4
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"II.—HAY CROP, 1843.—To part of a field, manured the previous year with farm-yard dung, was given 267 lbs. of Guano per imperial acre, at the cost of 31s., and the *extra produce* per acre was 22 cwt. of hay,

Which, at 3s. per cwt., is - - - £3 6 0

Deduct expense of Guano, - - - 1 11 0

Leaving in favor of Guano, - - - £1 15 0 per Acre.

"III.—WITH TURNIP, 1843.

No.	Quantity of land tried.	Description of Manure tried, and quantity per Imperial Acre.	Cost of Dung per Acre.	Cost of other Manures per Acre.	Total Cost per Acre.	Produce per Imperial Acre, stored Nov. 15, 1833.
	Acre.	Dung.	£ s. d.	£ s. d.	£ s. d.	T. Cwt.
1	$\frac{1}{2}$	Guano, 4 cwt. . . .	—	2 8 0	2 8 0	11 8
2	$\frac{1}{2}$	28 yds. Sulphate of Soda, 1 cwt. . .	5 12 0	0 4 0	5 16 0	9 8
3	$\frac{1}{2}$	Ditto Burned Bones, 6 cwt. . .	5 12 0	2 0 7	7 14 0	7 11
4	$\frac{1}{2}$	Ditto Bone-dust, 20 bushels . .	5 12 0	2 6 8	7 18 8	7 2
5	$\frac{1}{2}$	Ditto	5 12 0	—	5 12 0	4 19
6	$\frac{1}{2}$	Ditto Gypsum, 2 cwt. . . .	5 12 0	0 8 9	6 0 9	6 1
7	$\frac{1}{2}$	Ditto Guano, 4 cwt. . . .	5 12 0	2 8 0	8 0 0	7 13
8	1-16	Ditto Beech-ashes, 48 bushels . .	5 12 0	0 12 0	6 4 0	5 12
9	1-16	Ditto Gypsum, 6 cwt. . . .	—	1 1 0	1 1 0	A failure.
10	1	Bone-dust, 25 bushels . .	—	4 3 4	3 4 3	9 6
11	1	{ Ditto, 12 bushels; } { 133 lbs. Guano } . .	—	2 14 3	2 14 3	11 15
12	1	Guano, 356 lbs. . . .	—	1 18 2	1 18 2	11 0
13	1	Guano, 267 lbs. . . .	—	1 8 7	1 8 7	10 15

"November 30, 1843.—The turnip-crop on the field in which the above experiments were tried, was fully one-third deficient in quantity from crops generally grown on such land in this part of the country, the soil being heavy and under medium quality. All the turnip-crops in this neighborhood are, however, from one-third to one-half deficient this season.—*Quarterly Journal of Agriculture.*

GRASS AND HAY.

"The lawn on which the following experiment was made, has been under the scythe from 14 to 15 years; the soil is of a light sandy nature, over a layer of 10 or 12 feet deep of brown sand, which is superincumbent upon a bed of clay. It will be seen by our April experiment, that 3½ oz. Guano, per yard, produced a greater weight of grass than that which had 4 oz.

per yard ; this result rendered it desirable to ascertain whether $3\frac{1}{2}$ oz. per yard was the maximum for land such as this trial was made on. Our committee, who have taken a warm interest in this matter, suggested that another trial should be made : the result is now before you ; and though the season was far advanced (21st July and 4th August) and the lawn repeatedly mowed before the manure was applied, the effect of the Guano and nitrate on the hungry soil was truly surprising, for during the sultry month of September, the portion done over with Guano and nitrate formed a striking contrast in color and luxuriance to the surrounding sward.

APRIL EXPERIMENT.	RATE PER ACRE.	
	PRODUCE. GRASS.	MANURE. GUANO.
The produce of 1 square yard, on which 1 oz. Guano mixed with ashes was spread, weighed 3 lbs.	Tons. cwt. lbs. oz.	Cwt. lbs. oz.
The produce of 1 yard, on which $1\frac{1}{2}$ oz. Guano mixed with ashes was spread, weighed 3 lbs. 2 oz.	6 9 72	2 78 8
The produce of 1 yard, on which 2 oz. Guano mixed with ashes was spread, weighed 3 lbs. 11 $\frac{1}{2}$ oz.	6 15 5 0	4 5 12
The produce of 1 yard on which $2\frac{1}{2}$ oz. Guano mixed with ashes was spread, weighed 4 lbs. 4 oz.	8 0 78 12	5 45 0
The produce of 1 yard on which 3 oz. Guano mixed with ashes was spread, weighed 4 lbs. 11 oz.	9 3 74 0	6 84 4
The produce of 1 yard on which $3\frac{1}{2}$ oz. Guano mixed with ashes was spread, weighed 5 lbs. 14 oz.	10 2 63 8	8 11 8
The produce of 1 yard on which 4 oz. Guano mixed with ashes was spread, weighed 4 lbs. 10 oz.	12 13 99 0	9 50 12
	9 19 92 0	10 90 0
HAY.		
The produce of 21 square yards, on which $30\frac{1}{2}$ oz. Guano mixed with ashes was spread, weighed 69 lbs. $1\frac{1}{2}$ oz. The same, when dry or made hay, 24 lbs. 2 oz.	2 9 60 0	3 102 7
NITRATE OF SODA.		
The produce of 21 yards, on which $7\frac{1}{2}$ oz. nitrate of soda mixed with ashes was spread, weighed 56 lbs. $6\frac{1}{2}$ oz. The same, when made into hay, weighed 17 lbs. 1 oz.	1 15 15 0	0 107 13
GRAN. COMPOST.		
The produce of 21 yards, on which 42 oz. granulated compost was spread, weighed 42 lbs. 6 oz. The same, when made into hay, 15 lbs. $2\frac{1}{2}$ oz.	1 11 10 0	5 43 12
NITRATE OF SODA.		
The produce of 21 yards, without manure, 37 lbs. $14\frac{1}{2}$ oz. The same, when dry, 13 lbs. 6 oz.	1 7 52 0	
GRASS.		
The produce of 4 yards, on which 1 oz. nitrate of soda mixed with ashes was spread, weighed 10 lbs. 4 oz.	5 10 82 8	0 75 10
The produce of 4 yards, on which $1\frac{1}{2}$ oz. nitrate of soda was spread, weighed 11 lbs. 2 oz.	6 0 21 4	1 1 7
The produce of 4 yards, on which 2 oz. nitrate of soda mixed with ashes was spread, weighed 15 lbs.	8 2 6 0	1 39 4

Fall of rain in May, 3.10
Do. in June, 1.90

5 inches.

JULY EXPERIMENT.	RATE PER ACRE.			
	PRODUCE. HAY.			MANURE. GUANO.
	Tons.	cwts.	lbs.	oz.
The produce of 10 square yards, on which 3 oz. Guano per yard mixed with ashes was spread, weighed 9 lbs. 3 oz.,	1	19	78	12
The produce of 10 yards, on which 4 oz. Guano per yard was spread, weighed 10 lbs. 13 oz.	2	6	96	6
The produce of 10 yards, on which 5 oz. Guano per yard was spread, weighed 11 lbs. 5 oz.	2	8	99	4
The produce of 10 yards, on which 6 oz. Guano per yard was spread, weighed 11 lbs. 8 oz.	2	9	78	0
The produce of 3 yards, on which 7 oz. Guano per yard was spread, weighed 3 lbs. 11½ oz.	2	13	62	10
The produce of 3 yards, on which 8 oz. Guano per yard was spread, weighed 3 lbs. 11 oz.	2	13	5	11
The produce of 10 yards, without manure, 4 lbs. 11 oz.	1	0	28	12
				NITRATE OF SODA.
The produce of 2 yards, on which 2 oz. nitrate of soda per yard was spread, weighed 2 lbs. ½ oz.	2	0	99	10
The produce of 2 yards, on which 3 oz. per yard nitrate of soda was spread, weighed 2 lbs. 4½ oz.	2	9	32	10
The produce of 2 yards, on which 4 oz. nitrate per yard was spread, weighed 2 lbs. 5 oz.	2	9	108	4
The produce of 2 yards, on which 5 oz. nitrate of soda per yard was spread, weighed 2 lbs. 6½ oz.	2	11	108	2
The produce of 2 yards without manure, weighed 15 oz.	1	0	28	12
				AFRICAN GUANO.
The produce of 2 yards, on which 1 oz. Cape Guano per yard was spread, weighed 1 lb. 2½ oz.	1	4	11	2
The produce of 2 yards, on which 2 oz. Cape Guano per yard was spread, weighed 1 lb. 5½ oz.	1	9	3	14
The produce of 2 yards, on which 3 oz. Cape Guano per yard was spread, weighed 1 lb. 8 oz.	1	12	46	0
The produce of 2 yards, on which 4 oz. Cape Guano per yard was spread, weighed 1 lb. 12 oz.	1	17	91	8
The produce of 2 yards, on which 5 oz. Cape Guano per yard was spread, weighed 1 lb. 14 oz.	2	0	57	0
The produce of 2 yards without manure, 12 oz.	1	12	46	0

The following trial was made on the 4th August with a new description of Guano, from the Cape of Good Hope, which was reported to contain 40 per cent. of animal matter; the grass was cut on the 24th October:—

Rain in Aug. . . 2·60
Do. Sept. . . 2·20
Do. Oct. . . 8·00

10·80

Botanic Garden, Manchester,
December 15, 1843.

ALEX. CAMPBELL.

The Right Honorable Sir Robert Peel.

"At the Institution of the Tamworth Farmers' Club, which was celebrated by a public dinner on the 24th of October, 1843, in the Town Hall, Sir Robert Peel took the chair, and in the course of his opening discourse, spoke of Guano in the following terms :—

"You remember, Gentlemen, that I set out by stating that practical observations are much more valuable at meetings of this kind, than any elaborate eloquent common-places about the importance of agriculture. I therefore requested a friend of mine,—who I knew had carefully made an experiment, with respect to the merits of a new manure, the name of which, I have no doubt, is quite familiar to you, *Guano*,—I requested him to make an experiment with the greatest care and fairness, and to communicate to me the result. Gentlemen, he has done so, and I am quite sure you will excuse me if I state to you the particulars of the experiment. My friend took a field of two acres, and planted it with potatoes. The ridges in which the potatoes were grown were of the same length, and the potatoes of the same quality; and the produce of the several ridges having been taken up and measured, the average result of the produce—(the soil being the same, the potatoes the same in quality, the manure being applied with perfect fairness, and exactly in the same manner)—the average result of the produce, in proportionate returns, was this :—

The stable manure,	-	9	bushels of potatoes.
Potter's manure,	- -	11	" "
Guano,	- - -	15	" "

"I asked for further details, in order that the information might be complete, and here they are : the Guano and Potter's manure (so called from the name of the person who prepares and sells it) were each mixed with wood-ashes and fine mould, in the proportion of one bushel of Guano, or Potter's manure, to six bushels of ashes and mould. A bushel of Guano weighs about 65 lbs. ; * three bushels of Guano and three of Potter's manure, making 510 lbs. in weight, were put on the ridges at two different times, being at the rate of 3 cwt. per acre, each of these manures costing 14s. a cwt. ; half of each was put into the ridges when the potatoes were planted, and the other half when the potatoes were appearing about one inch out of the ground, covering in the Guano and Potter's, by hoeing and raising the ridges. The potatoes were planted on the 4th of April, and taken up early in October. The produce exceeded 600 bushels, the field having been previously exhausted, and in very bad order. The total expense, including every charge, was 16*l.* ; and calculating the value of the potatoes at 1*s.* the bushel, the profit on the two acres was 14*l.*, the value of the land being about 1*l.* per acre if let. Such was the result of that experiment ; and it was made with perfect fairness."—*Times*, of 25th October, 1843.

* In the *Times* the weight is called 85 lbs. ; but this is an error of the press, the *real* weight of Peruvian and Bolivian Guano, when unadulterated and undamaged, being about 65 lbs.

"WALTON NURSERY, near Liverpool, Feb. 15, 1844.

"Sir,—I beg to acknowledge your letter of the 12th instant, and in answer to your question respecting the durability of Guano as a manure, I have great pleasure in giving you my opinion, which is founded on experiments with the Guano I have had from your house during the last three years. I am now thoroughly convinced that Guano is not only a most valuable manure for the first crop, but for crops for years after, according to the quantity at first applied.

"I have noticed minutely the effect of Guano on the crops for three successive years, where it was first applied at the rate of 4 cwt. to the statute acre. The first crop was grass, the second turnips, the third oats, and every year each of those crops were excellent and decidedly better than when I applied 20 tons of farm-yard manure to the same quantity of land adjoining. There is, therefore, no longer any doubt in my mind about the lasting qualities of genuine Guano as a manure, where it is properly applied for permanent purposes, nor can there be any doubt of its being the cheapest manure we know of; for in the experiments I allude to the Guano cost 2*l.* 8*s.*, the farm-yard manure 10*l.*—ten shillings per ton being the common price for the best horse and cow dung here in the spring time.

"In this neighborhood a great deal of Guano has been used for top-dressing grass land at the rate of 2 cwt. to the acre, and in all cases that I have heard of, it has given very great crops the first year: but some of the parties who have used it in this way, complain that they did not see much improvement in the crop the second year. I should have been very much surprised if they had, for I have many times seen 5*l.* worth of farm-yard dung applied as a top-dressing to an acre, and never could see any advantage of it after the first year. If people want manure to have a permanent effect, let them bury it in the land, and they will have the benefit for years; but if they take and scatter it to the sun and wind, without ploughing or digging it in, they will never see its effect after the first crop.

"I continue to use Guano to crops of all kinds on my farm or garden, and in my nursery grounds, and in a liquid state I have used it in my hot-houses and green-houses, to plants of every kind, with great benefit to all.

"In market-gardens and kitchen-gardens of any kind, I consider Guano invaluable; for by proper application of the liquid in the spring months, you not only double the quantity of many crops, but with such as rhubarb, sea-kale, asparagus, &c., you get them much earlier, which is a double advantage. In short, in all the departments of my business, whether the farm or nursery, Guano seems now indispensable. Whenever we see a crop not thriving, we apply Guano the first *wet* day afterwards, and if the crop is not too far advanced, it generally has a very good effect.

"Manure is the mainspring in all farming or gardening operations; without plenty of it our labor is in vain. We may drain well, subsoil,

plough or dig deep, but without abundance of manure, land can no more be *profitably* worked than a horse can that is half fed.

"With the assistance of Guano, I had plenty of grass to mow last year from the first week in April until the first week in December, besides a good bite of after-grass for grazing. To conclude, I beg to state, as my opinion, that the discovery of Guano is by far the most important of the age, either for agriculture or horticulture, and I for one feel particularly indebted to you for its introduction into England.

"I am your most obedient servant,

"WM. SKIRVING.

"WILLIAM JOSEPH MYERS, Esq."

"WREXHAM, 15th February, 1844.

"*Dear Sirs,*—Since I wrote to you last year, I have continued my experiments with your Peruvian and Bolivian Guano, and they have most fully confirmed my opinion of its great value as a top-dressing for grass-land. Much care, however, is requisite not to use it in too large quantities, or in dry weather.

"As far as my experience goes, 3 cwt. (or thirty shillings' worth, wholesale price) is ample to manure a statute acre, producing a large and early hay-crop, and abundance of after-grass.

"It must not, however, be applied all at one time, but one-half when the field is put up for hay, and the other as soon after mowing as the weather will permit, it being absolutely necessary in both cases to sow during, or immediately before, rain.

"I tried it this way last season with the best results; both my crop of hay and the after-grass were the finest in the neighborhood; and, with the exception of a very few mangels and turnips, also raised with Guano, my cows have had nothing but the hay or grass so grown, have been in the best health, and are at present giving as much milk as those of any of my neighbors.

"When a large quantity (4 or 5 cwt.) of Guano is used at once, the effect on grass-land, instead of being beneficial, is often most injurious, causing a rapid growth of extremely coarse grass, and destroying the finer kinds. If those who had used it in this way had satisfied themselves with 3 or 4 cwt., divided into two, or even three sowings, the result would have been altogether different.

"The best and most economical mode of preparing it for use is to spread 2 cwt. of dry soil three or four inches thick, lay 1 1-2 cwt. of Guano over it, and 2 cwt. of soil on that again, leaving the heap for two or three days protected from the weather, when it must be well mixed and sifted through a common garden sieve. Thus prepared, it can be sown without inconvenience to the farmer, and spread without loss equally over the field.

"Another year's experience in the kitchen garden has proved the value of Guano, both as a manure and as a preventive to clubbing, so common to all the cabbage tribe. My gardener digs it well in at the time of planting,

and uses it as a top dressing when required ; applied in this way, during rain, its effects have sometimes been wonderful.

" It answers particularly well also for onions, leeks, spinach, asparagus, and sea-kale. With a mixture of two to about three barrowfuls of sand and good soil—half-and-half—I obtained this autumn, from root-cuttings put into the ground in the spring, sea-kale equal in size and strength to those from old plants.

Believe me, dear Sir,

" Yours most truly,

" D. W.

" MESSRS. GIBBS, BRIGHT & Co."

" DRUMORE, February 17, 1844.

" *Gentlemen*,—I have much pleasure in testifying to the splendid results experienced by our agriculturists from the application of Guano, imported by me from your stock in spring last, and which has been used upon upwards of 200 different farms in this district (the Rhyns of Galloway), embracing almost every variety of soil, universally producing results superior to the most sanguine anticipations ; convincing the most skeptical of its unrivalled superiority as a manure, whether applied to white or green crops.

" It was used here in a very limited extent in the spring of 1842, and so far it appears to have as much durability and effect upon the after-crops as any other manure now in use.

" I have been kindly favored with reports from a few of our most eminent farmers and agriculturists that have had two years' experience of Guano, and which I beg to hand you herewith. I expect a few more in course of a post or two, that I will forward upon receipt, as they may be important to lay before the public.

" There is not one farmer that I sold the article to last season, but expresses himself highly satisfied of its efficacy ; and those that have used it two years are quite convinced of its durability, particularly when applied at the rate of 4 cwt. per acre. 2 1-2 cwt. per acre has been found to produce an excellent crop of turnips ; but in general that quantity has not told so effectually on the after-crops as when a greater quantity has been used.

" From what I have seen of Guano in this district, it appears peculiarly adapted to cold, damp, or mossy soils that have been thoroughly drained, where bones or farm-yard manure is of little effect. Guano appears to me to require a considerable quantity of moisture to make it act properly. I have observed that it is sooner affected by drought than bones or dung, when applied to light dry soils. I consider that a dropping season would greatly favor Guanoed crops upon dry sharp soils ; still the results have been splendid upon every variety. I know one farmer that had 32 cwt. of potatoes per acre more from Guano alone, applied at only 3 cwt. per acre, than he had from either full dung or half dung and half Guano, in the same field : it was a light gravelly soil. The foregoing are a few general

remarks, according to my own observations, referring to the reports herewith.

I am, gentlemen, your most obedient servant,

“JAMES WATSON.

“Messrs. WM. J. MYERS & Co.”

“CAPESTHORNE, February 13, 1844.

“Sir,—I received yours this morning, and now, when a little at leisure, I will answer your inquiry regarding Guano.

“From the pretty extensive and detailed experiments with Guano that we have made at Capesthorne since you first imported it, I might go into a considerable tabular account of its superiority over every other manure that we have tried; but its powerful effects being universally admitted, it may be enough now for me to say, on the score of its superiority, that it has outstripped any of the other manures which we have tried it with, as well for cheapness as for quantity of produce of every kind of crop. On Mr. Davenport’s Woodford estate, in 1842, we tried it with wheat at 2 1-2 cwt. per statute acre, which crop turned out the best in the township. On the same estate, on another field, we sowed a meadow with 2 cwt. to the acre: this was allowed by all who saw it to be the best crop of hay they had ever seen in that part of the country: this was on a farm Mr. Davenport has taken into his own hand to improve. On the same farm we have now growing about thirty acres of wheat, manured with 2 cwt. of Guano to the acre, which looks beautiful. We always sow along with Guano an equal quantity of gypsum, which tends greatly to prevent the good qualities of the Guano from flying off. Improper treatment of good Guano, and the use of adulterated stuff, have in many instances brought discredit on the name; but if the best is sown in a proper way, none will be disappointed but in one thing, and that is, in having a much heavier crop than what they could expect. As to its enduring for more than one crop, we have many satisfactory instances. I will name one or two. In 1842, on the home-farm here, a piece of ground was done with 4 cwt. per acre, while the other part of the field was done with good farm-yard muck: both these plots were sown with yellow turnips; the great superiority of the oat crop in 1843, where the Guano was sown, over the farm-yard manure, could be seen to an inch by the least attentive observer in passing along the end of the field; and the grass-seed plants on the same piece of ground, before the present storm set in, were stronger and better than where the farm manure was laid. A piece of pasture sown at the rate of 2 cwt. to the acre in 1842, up to the present time shows a much finer plant and greater luxuriance than where nothing was put on. Again; on a piece of grass-land sown in 1842, ploughed up in 1843, and sown with oats, to a furrow the superiority of the crop could be seen at a considerable distance. Not knowing the exact nature of the pamphlet you are publishing, I have not by any means written the above to be inserted as it stands; but if it contains anything like the matter which you wish, you can put it in such a shape as will suit your publication; and if there is anything connected

with the subject which I have omitted, I will be glad to afford you every information that lies in my power. I am not sure whether one of my pamphlets was sent to you or not: if this has been omitted, you will get one at Mr. Cannel's office, Castle Street. If you wish a detailed account of our experiments for the two by-gone years, you shall have them with pleasure.

I am, Sir, yours very respectfully,

“GEORGE BROWN.

“To WM. J. MYERS, Esq.”

Shelton, Shrewsbury, February 14, 1844.

“GENTLEMEN—In the year 1842, I supplied about 40 gentlemen and practical farmers with Guano, residing in the counties of Salop and Montgomery, in quantities from 1 ton to 3 cwts. each. It was generally applied in various ways; top-dressing wheat, barley, vetches, and grass; also to turnips and potatoes; and they all speak in the highest terms of the fertilizing effects it produced upon the different crops, much exceeding their expectations.

“In the year 1843, I supplied upwards of 100 gentlemen and practical farmers of the above counties with Guano, and a great part was applied to turnips, potatoes, and grass, with the most beneficial effects: the grass cutting in some instances double the quantity of hay and aftermath, more than other parts of the same fields produced; and the turnips a much heavier and better crop than from farm-yard manure. One gentleman told me he had as fine a crop of turnips as ever grew from Guano, and the cost per acre did not exceed the value of the carting of the farm-yard dung per acre to the adjoining field.

“Guano is particularly adapted to light soils, where the straw crop is seldom heavy, and consequently produces a small quantity of manure; and also where the lands lie a great distance from the homestead, the farmer may, with one horse and cart, convey as much Guano as will manure 8 acres of land in a few hours, wherein it would take 2 teams, with perhaps 8 or 10 horses several days, to cart manure to the same extent of land. I consider Guano a manure of great importance to farms of the above description.

“I recommend to be applied to each acre 3 cwt. I have so applied it, and find the second year's crop to be equal to the first year.

“Some Guano sold in this country has not had the desired effect, as some parties expected, either by applying it improperly, or purchasing an inferior article at a few shillings per ton less cost. There is some Guano adulterated in different ways, and can easily be done without detection. Your well-conditioned Guano may be adulterated by adding any fluid to it, so as to increase the weight of it 10 or 15 per cent., and therefore enables parties to sell at a less price.

"If you think this statement of mine, or any part, will be worth your notice to add to your pamphlet, you are at liberty to make use of it; and if you wish to put any other questions to me I will readily answer them as correctly as I can.

"I beg to remain,

"Yours faithfully,

"JOHN EDWARDS.

"To Messrs. W. J. Myers & Co."

AGRICULTURAL REPORTS.—NORTHUMBERLAND.

GUANO will be much used for manure in another year. It appears to have a wonderful effect upon almost every kind of crop. We tried it as a top-dressing for wheat, on the 11th of May last: quantity, 1 cwt. to an acre. Its effects were in a few days visible from a distance, and on reaping, the extra bulk of straw has been 4 thraves to the acre. Upon a future occasion we shall notice the judicious observations of that distinguished agriculturist, John Grey, Esq., of Dilston, upon various experiments made with Guano.
—*Gateshead Observer.*

WEST INDIES.

"*Extract from one of eight Treatises on agricultural subjects, published in Jamaica, having been written for a Prize of One Hundred Guineas, offered by LORD ELGIN, the Governor of the Island, to be awarded to the author of the best Essay on these subjects.*

"On the 6th July, 1842, we applied 5 tons of Guano to land turned up with the plough. The soil is light small-shot, or manganese, the poorest we have. The quantity given was one pint to four feet; and as there was more land opened than the Guano would manure at this rate, we applied common compost from the cattle-pen to the remainder, in the usual way and quantity: I have thereby been enabled to contrast their comparative merits. The canes by both methods of manuring were planted at the same time. Those with the common compost will be fit to cut in the usual time for plants, say at *fourteen or fifteen months old*. Those with Guano must be cut in June, or at *eleven months old*. At this rate did their comparative growth commence, and so it has continued to maturity." To this is added the following additional report:—"The canes planted with Guano in July, 1842, are now made into sugar (June, 1843). They have made excellent produce. In quantity they have exceeded the plants manured in the usual mode at the rate of one-eighth of a hhd. per acre. Had they been cut six weeks sooner their produce would have been still greater.

"The mixture recommended is one-sixth Guano to five-sixths of a quart, consisting partly of ashes, marl, if at hand, and mould.* The quantity of this mixture to be applied is one quart to every four feet.

"The author of this treatise, in a letter dated 25th July, 1843, says:—"The first ratoon sprouts from the roots of the plants lately cut, and which were originally manured with Guano, are coming up with a rapidity which many would consider magical, without any further application of manure."

ST. VINCENT.

"My Dear Sir,—

"I have pleasure in sending you the enclosed copy from one of our St. Vincent friends, received from the mail of yesterday.

"Yours very truly,

"WM. GIBBS, Esq., Lime-Street,
21st Dec., 1843."

"P. CRUIKSHANK.

"*Extract from a letter from PETER CLARK, dated*

"BELLE VUE ESTATE, 3d Nov. 1843.

"All the canes for the ensuing crop are looking well, more especially those that got the Guano. I think it is the best and cheapest manure yet imported. Such a small quantity does, and it is so easily carried to the difficult parts of the piece, that, taking everything into consideration, it is cheaper than making manure upon the estate, especially if there are no other means of littering the pens, than by taking trash out of the cane piece. The next piece to be holed, 10 acres, will be planted without manure, depending on Guano being set out early. It requires to be put on the cane stool immediately after the second weeding."

"*Extract from a letter written by a Correspondent of Messrs. Gibbs, Bright & Co., Liverpool.*

"JAMAICA, Dec. 5, 1843.

"I saw a piece of canes at Woodchurch estate, about 12 miles from Meylersfield, on the 14th of November, first ratoon canes, to which Guano had been applied at one wine-glass to each root, mixed with two-thirds burnt earth; they appear finer than most plant canes I have ever seen. The Guano was given on the 10th July.

"J. H. COOKE."

* This quantity is probably sufficient, but it is only one-third of what was used in the experiment above detailed.

"Extracts of various letters addressed to Messrs. Gibbs, Bright & Co., Bristol, by their Correspondents.

"BARBADOES, 30th May, 1843.

"I have little doubt that at the present reduced price, the article will become a great favorite as a manure, and that you will receive large orders for it. I had some conversation with Mr. Heath on the subject, who has tried it largely in different parts of the Island, and of course on different soils. The actual result he does not know, but is inclined, from circumstances, to think very favorably of it. In St. Vincent it is in high repute, the land, when it has been applied, yielding far better than when ordinary manure has been used.

"P. KILKELLY."

"BARBADOES, 6th July, 1843.

"It is becoming a favorite article as a manure.

"P. KILKELLY."

"BARBADOES, 18th September, 1843.

"I had a part of that sent out by you per 'Hornby,' and which I have applied to my canes, and find its properties of the utmost benefit, and have no doubt of its being used very extensively in the island. Should you be sending out any more, I shall be very glad to try it on a larger scale.

"THOS. F. COX."

"JAMAICA, 5th September, 1843.

"There is no doubt of its efficacy.

"WALCOTT & NEPHEW."

"BARBADOES, 23d August, 1843.

"Less than half a ton is not sufficient to manure an acre of canes in a proper manner; it is getting into high estimation as a manure, and the canes manured with it are greener than those which have been manured with animals.

"WM. SHARP."

"JAMAICA, 4th July, 1843.

"If reasonable (in price), we have but little doubt that a great demand might be created for it, as we believe its properties are adapted to the sugar cane.

"ELIN, WRIGHT & Co."

"JAMAICA, 22d August.

"From what I have seen of the application of Guano, I think great benefit will be received from it. The effect on a piece of ratoon canes to

which it was applied, at the rate of half a ton to the acre, was remarkable. It caused the canes to take a rapid and luxuriant growth, so that they covered the ground in a very short time, which saved one clearing, if not more, and a great advantage, keeping the land cool. I have seen sugar made from land manured with Guano: the color was not quite equal to some on the estate, but the quantity more than doubled."

"BARBADOES, 25th September, 1843.

"I have great pleasure in stating that the good effects of Guano manure are beginning to show themselves in the growing canes; and from the success that has attended its application, I think you will have large orders for it.

"P. KILKELLY."

"BARBADOES, 14th October, 1843.

"As to the merits of Guano as a manure, I have no hesitation in saying that wherever I have seen it applied to canes, either to the plants or ratoons, the effect has been most surprising. They change to a deep green, and commence a vigorous growth; and should the result accord with their promise, it is my conviction that a succession of unexampled crops must follow the importation and use of this manure. This old island will be again fertilized, and a new era of prosperity open to it.

"J. D. MAYCOCK."

COFFEE.

"JAMAICA.

"At present, we may say, that Guano having been found elsewhere a highly beneficial application to fruit-trees, there can be little doubt that where cultivation has declined from the age or heavy bearing of the trees, or from the exhaustion or washing away of the soil, benefit would be derived from the use of it or some of the other strongly stimulating manures now in general use. From the chemical analysis of Guano, it appears particularly suited to the coffee-tree. This, however, is only to be tested by actual experiment. We will give all the information we possess as to the proportions used, and the mode of application to fruit-trees elsewhere, and the results as they become known; and we cannot doubt that practical men will be found to test its effects by experiment. We must, however, repeat the caution given in another column of our paper, and beg purchasers to be careful in obtaining what is genuine. The results of Guano on grass-lands must be highly interesting to many whose pastures have suffered from various causes. Its application has produced effects scarcely to be credited, if they are not well authenticated. One form of applying it, strongly recommended, is very simple and easily tried. On one pound of good Guano pour eight gallons of water, let it stand twenty-four hours,

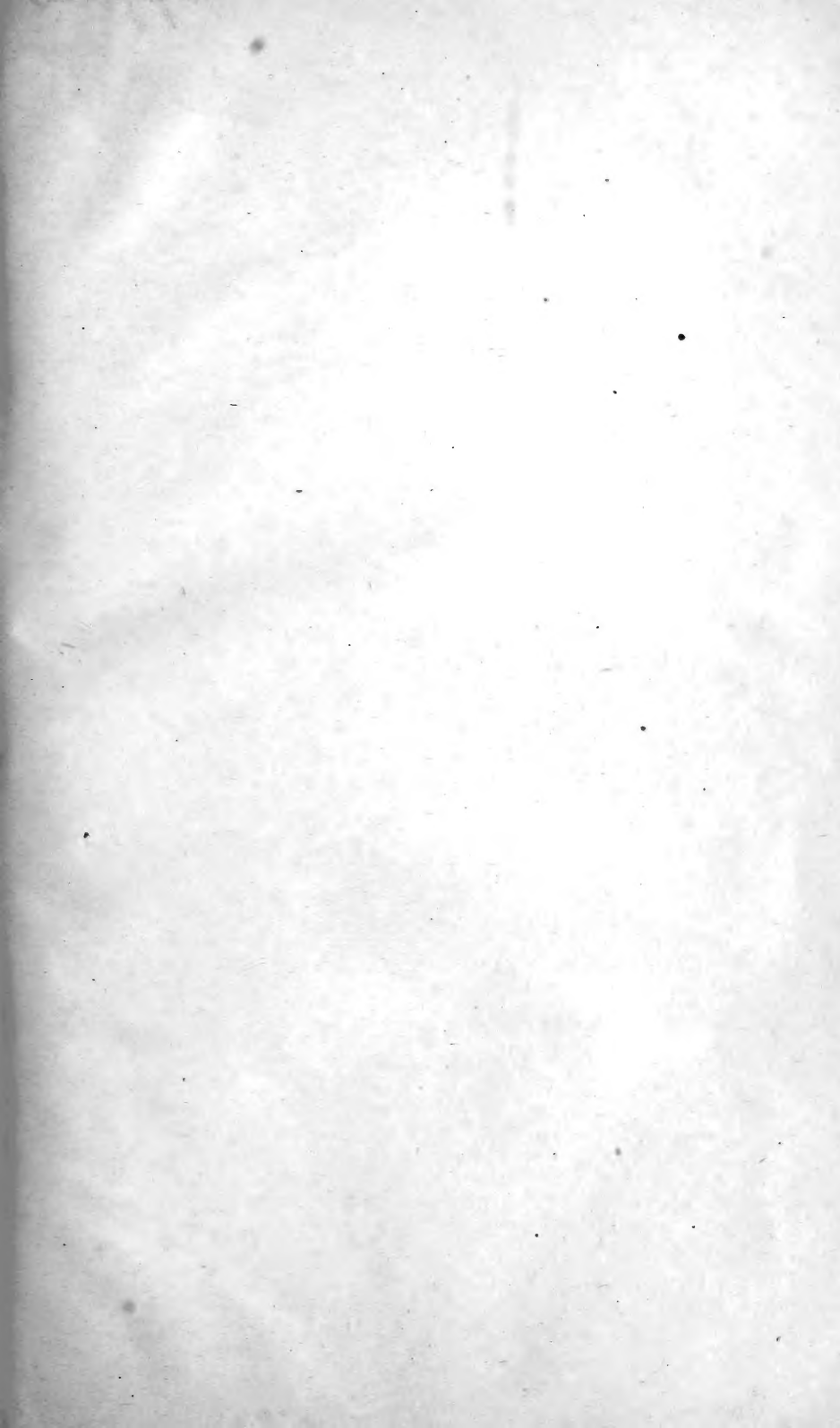
then add eight gallons more water, and let the whole stand forty-eight hours. This water may be applied to grass-land or vegetable gardens, it is stated, with the best results. A watering pot would help to distribute it equally; others recommend a stronger solution, four pounds of Guano to remain in twelve gallons of water twenty-four hours: the water to be then drawn off for use; twelve gallons of fresh water may be put on the same Guano, and after lying forty-eight hours, be used as the first. A trial of both these proportions will test their comparative value.

“A. B.”

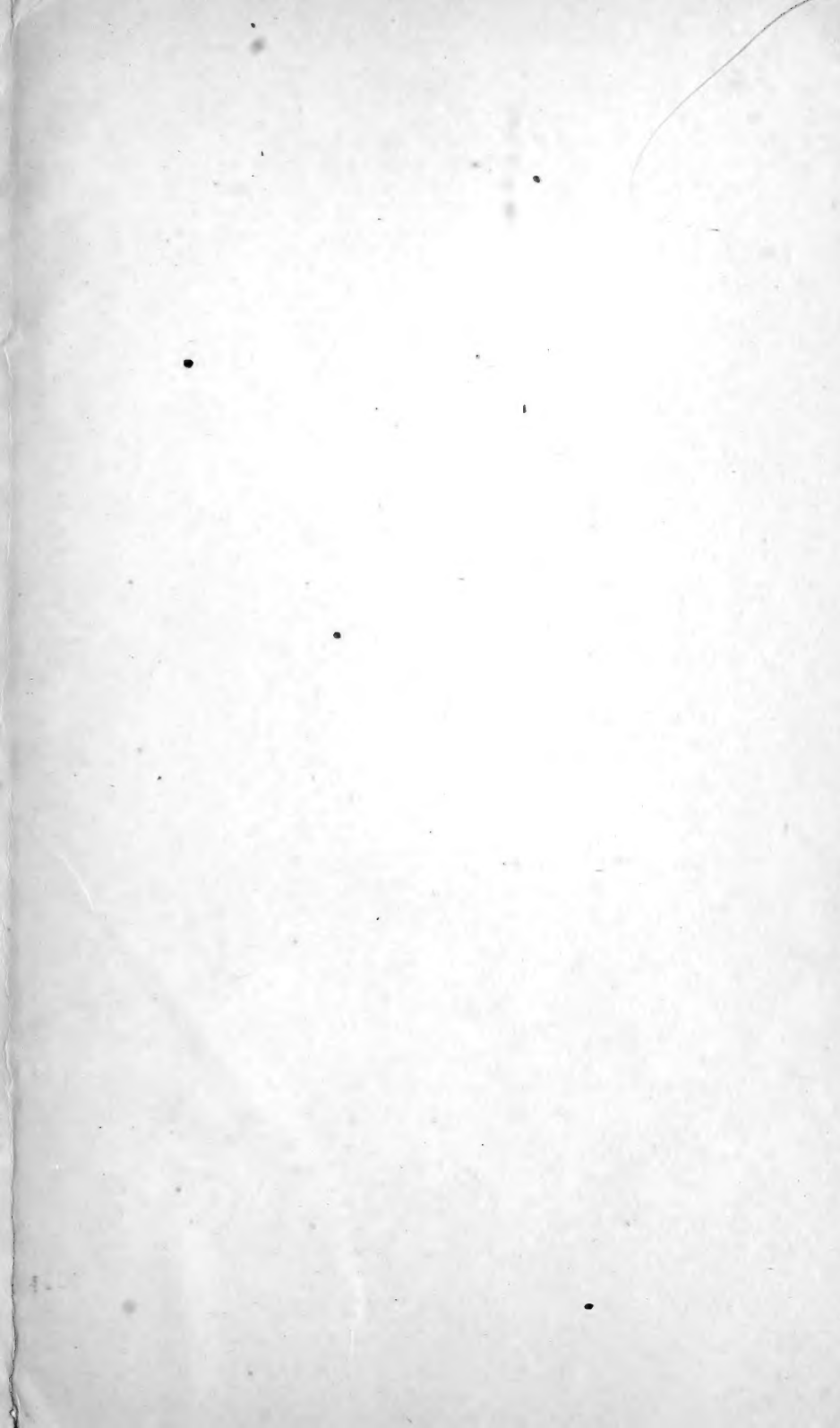
“*From the Supplement to the Jamaica Times, of January 20, 1844.*”

“From the ashes of the sugar cane (Mr. Herepath remarks) I should conceive that no better manure could be found for that plant than Guano, or urine and night-soil: the former contains everything which the cane requires, except potash, and might easily be afforded by returning the ashes of the canes themselves; or a mixture might be made of some of the wood-ashes of the estate, with the other components of the manure. If Guano be selected, those varieties must be rejected which get very moist, or run to water in a damp atmosphere, as they abound in common salt, which is not required by the cane, to the detriment also of the other matters, viz., the phosphates and the oxalates of ammonia.

Abundant evidence is given in the foregoing extracts, to prove that Guano is a general and very powerful fertilizer; accelerating the growth, and adding to the product of every species of vegetation, whilst it permanently invigorates the soil. Farmers are cautioned in purchasing, to take such only as is known to be genuine. The *Peruvian* stands pre-eminently FIRST, the *Bolivian*, SECOND, the *African* being of THIRD quality. It will not be prudent to use any other kinds, without previous analysis, and that from Africa varies so much in quality, that its present price in England is only half that of PERUVIAN GUANO.







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